



FLAAR
MESOAMÉRICA

WETLANDS #7

EDIBLE PLANTS OF WETLANDS

YELLOW NUTSEDGE

Cyperus esculentus

Swamps and Marshes
Of Livingston, Izabal

NICHOLAS HELLMUTH

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LIVINGSTON

Plants



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



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Starting in January 2021, we will have two different series of FLAAR reports on plants of Guatemala.

One series will be focused on the area where we found and photographed the species, with basic list of suggested reading. The purpose of this 1st edition is to help provide our photographs and information on where botanists, students, and interested members of the public can find and visit this plant themselves.

Once our team has time (and funding) we will then do a 2nd edition with comparative comments about the same tree or vine in other areas of Guatemala and adjacent parts of Mesoamerica, especially: Chiapas, Tabasco, Campeche, Yucatan, Quintana Roo, and Belize.



Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Apr. 25, 2021. Playa Aldea Buena Vista, Tapón Creek, Livingston, Izabal.

Camera: iPhone 12 Pro Max.



GLOSSARY

Humedal is a generic term in Spanish for wetland, generally more **marsh**-like than **swamp**-like.

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.

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.

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.

Seasonally inundated ... means that during the rainy season a flatland has standing water (several centimeters to almost a meter; obviously varies by rainfall and drainage). A tinal is a seasonally inundated area of palo de tinta (palo de Campeche, *Haematoxylum campechianum*). Some corozeras, if on a flat area, are seasonally inundated (two corozeras between Yaxha and Nakum and one on the west edge of the ruins of Naranjo (Parque Nacional Yaxha, Nakum and Naranjo). A corozera is an area of predominantly corozo palm, *Attalea cohune*. The Savanna East of Nakum was bone dry when we visited it in 2018-2019 field seasons; but had snail shells everywhere, documenting that in a more rainy year much of this same "savanna" has standing water. Tasistal,

some guanal areas, escobal areas are also seasonally inundated (Lundell 1937 for some areas of Peten; but not the entire departamento).

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.

Wetland or **wetlands**, to me is a generic word to cover swamps, marshes, and seasonally inundated areas. 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 tintal swamps to see what was 100 to 200 meters inland.



Life on land is the Sustainable Development Goal (number 15, proposed by the United Nations) which claims to ensure the conservation of terrestrial and freshwater ecosystems. Municipio de Livingston has multiple natural areas associated to rivers and wetlands, for example.

INTRODUCTION TO *CYPERUS ESCULENTUS* AS A WETLAND FOOD RESOURCE

While doing botanical research in the lakes, lagoons, rivers, swamps, marshes, bogs and seasonally inundated savannas of Parque Nacional Yaxha, Nakum and Naranjo during 2018-2019 it was clear that these wetland areas would have needed to be utilized by the Classic Maya inhabitants, since most hilltops were filled with house mounds (so no place for large maize fields on hilltops).

While doing botanical research in the seasonally inundated tasistal flatland areas of Arroyo Petexbatún and Arroyo El Faisán (Municipio de Sayaxché, October 2019 and early 2020), it was clear that these areas were underwater several months in most years: and they had lots of potentially edible plants.

And now while doing comparable research in the lakes, lagoons, rivers, swamps, marshes, and along the coastal area of Municipio de Livingston, we are finding that more plants native to these wetlands than I had ever imagined are edible.

But what really imploded by research brain cells was the single paragraph in a crucial article by Fedick (2010): This single paragraph has initiated an entirely separate sub-project within my overall botanical and ethnobotanical research:

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.



Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Apr. 25, 2021. Playa Aldea Buena Vista, Tapón Creek, Livingston, Izabal.

Camera: iPhone 12 Pro Max.

This single paragraph has initiated an entirely separate sub-project within my overall botanical and ethnobotanical research:

EDIBLE PLANTS OF WETLANDS

FOOD POTENTIAL FOR THE CLASSIC MAYA FROM SWAMPS AND MARSHES

All my experience and understanding of Classic Maya civilization was based on monumental architecture on hilltops and slash-and-burn milpa agriculture on the hillsides. And even as I learned from all the Mayan agricultural publications of the 1990's onwards, the wetlands focus was primarily on raised field agriculture, chinampas, etc: agricultural engineering by pre-Columbian peoples. But at Yaxha, Petexbatún (Municipio de Sayaxché), and Municipio de Livingston, all the edible plants of the swamps, marshes and riverside areas are wild and native: none require monumental agricultural labor. When you walk through a wetland and see a tasty begonia, you simply eat it! (ps, they also grow on hills and ruins, so are not restricted to wetlands).



Photo by: María Alejandra Gutiérrez, FLAAR Mesoamerica, Apr. 25, 2021. Reserva Aldea Buena Vista, Tapón Creek, Livingston, Izabal.

Camera: Canon 1D X Mark II. Lens: Canon 50mm f/2.5 Macro 1:1 Settings: 1/8,000 sec; f/5.6; ISO 8,000.

MY PERSONAL EXPERIENCE WITH *CYPERUS ESCULENTUS*

Cyperus esculentus was in my research report on Beverages of the Maya (not yet published). *Cyperus esculentus* is listed as edible in Standley and Steyermark 1958: 122-123). But I did not really notice this plant until I read the statement by Fedick (2010).

This is because most botanists focus on trees, trees, trees. The Plan Maestro list of “plants” for Yaxha includes only trees: an antiquated 1992 list by Dix and Dix. Zero other plants besides trees. When we did field work at PNYNN (Parque Nacional Yaxha, Nakum y Naranjo), during 2018-2019 we did probably 70% trees: 28% bromeliads, orchids, vines, lianas, ferns; but did indeed photograph reeds, sedges, and grasses. Now in our Municipio de Livingston project we are focusing more than 25% of our field work on plants of swamps, marshes, and riverside plants. Plus, waterlilies. I obviously love to study trees, but we are now focusing on trees with edible fruits that grow facing rivers, swamps, or lagoons.

And for Parque Nacional Yaxha, Nakum and Naranjo, we now realize how crucial it will be to study every riverine plant; every grass, reed, and sedge that grows along the edges of the lakes, lagoons, and rivers of this park.

FULL BOTANICAL NAME

Cyperus esculentus L. is the accepted name. But typical mish-mash: it is also called *Cyperus esculentus* (L.) Roem. & Schult

Eleocharis caribaea (Rottb.) S.F.Blake is a synonym of *Cyperus esculentus* (L.) Roem. & Schult

Sedge family, Cyperaceae.



Photo by: María Alejandra Gutiérrez, FLAAR Mesoamerica, Apr. 25, 2021. Reserva Aldea Buena Vista, Tapón Creek, Livingston, Izabal.

Camera: Canon 1D X Mark II. Lens: Canon 50mm f/2.5 Macro 1:1 Settings: 1/2,000 sec; f/5.6; ISO 8,000.

HERE ARE SYNONYMS FOR *CYPERUS ESCULENTUS L.*

- Chlorocyperus aureus* (K.Richt.) Palla ex Kneuck.
Chlorocyperus phymatodes (Muhl.) Palla
Cyperus aureus Ten. [Illegitimate]
Cyperus bahiensis Steud.
Cyperus buchananii Boeckeler
Cyperus callistus Ridl.
Cyperus chrysostachys Boeckeler
Cyperus cubensis Steud.
Cyperus damiettensis A.Dietr.
Cyperus esculentus var. *angustispicatus* Britton
Cyperus esculentus f. *angustispicatus* (Britton) Fernald
Cyperus esculentus subsp. *aureus* K.Richt.
Cyperus esculentus var. *cyclolepis* Boeckeler ex Kük.
Cyperus esculentus var. *esculentus*
Cyperus esculentus f. *esculentus*
Cyperus esculentus f. *evolutus* C.B.Clarke
Cyperus esculentus var. *heermannii* (Buckley) Britton
Cyperus esculentus var. *helodes* (Schrud. ex Nees) C.B.Clarke
Cyperus esculentus var. *leptostachyus* Boeckeler
Cyperus esculentus var. *lutescens* (Torr. & Hook.) Kük. ex Osten
Cyperus esculentus var. *lutescens* (Torr. & Hook.) Kük.
Cyperus esculentus var. *macrostachyus* Boeckeler
Cyperus esculentus f. *macrostachyus* (Boeckeler) Fernald
Cyperus esculentus var. *phymatodes* (Muhl.) Kük.
Cyperus esculentus f. *princeps* C.B.Clarke
Cyperus esculentus var. *sativus* Boeckeler
Cyperus esculentus var. *sprucei* C.B.Clarke
Cyperus fulvescens Liebm.
Cyperus gracilescens Schult.
Cyperus gracilescens Roem. & Schult.
Cyperus gracilis Link [Illegitimate]
Cyperus heermannii Buckley
Cyperus helodes Schrad. ex Nees
Cyperus hydra Kunth [Illegitimate]
Cyperus lutescens Torr. & Hook.
Cyperus melanorhizus Delile
Cyperus nervosus Bertol.
Cyperus officinalis T.Nees
Cyperus pallidus Savi [Illegitimate]
Cyperus phymatodes Muhl.
Cyperus phymatodes var. *heermannii* (Buckley) S.Watson
Cyperus repens Elliott
Cyperus ruficomus Buckley
Cyperus sieberianus Link
Cyperus tenoreanus Schult.
Cyperus tenorei C.Presl
Cyperus tenorianus Roem. & Schult.
Cyperus tuberosus Pursh [Illegitimate]
Cyperus variabilis Salzm. ex Steud.
Pterocyperus esculentus (L.) Opiz
Pycrus esculentus (L.) Hayek



Photo by: María Alejandra Gutiérrez, FLAAR Mesoamerica, Apr. 25, 2021. Reserva Aldea Buena Vista, Tapón Creek, Livingston, Izabal.

Camera: Canon 1D X Mark II. Lens: Canon 50mm f/2.5 Macro 1:1 Settings: 1/1,600 sec; f/8; ISO 8,000.

MAYAN NAMES FOR *CYPERUS ESCULENTUS*

“Cuando se relata la creación del hombre en sus diferentes etapas, siendo común en las mismas que el hombre es hecho por elementos de la naturaleza. Por ejemplo, durante la primera creación el hombre fue creado de madera de Tzité o árbol de pito (*Erythrina* sp.) y la mujer de zibak (*Cyperus* sp.)”

(Azurdia 2016).

LOCAL NAMES FOR *CYPERUS ESCULENTUS*

Chufa

Cebollín, cebolla de río, sivac, suchipaite

(Williams 1981: 103).

There are different local names in every different part of Mesoamerica.

HOW MANY OTHER PLANTS OF GUATEMALA HAVE THE SAME SPANISH NAME?

Cebollin is the name given to *Allium schoenoprasum*

HABIT FOR *CYPERUS ESCULENTUS*

Herb.



Photo by: Nicholas Hellmuth, FLAAR
Mesoamerica, Apr. 25, 2021. Playa Aldea Buena
Vista, Tapón Creek, Livingston, Izabal.

Camera: iPhone 12 Pro Max.

HABITAT, IN WHAT ECOSYSTEM(S) CAN YOU FIND **NATIVE *CYPERUS ESCULENTUS*?**

Wet fields, marshes, shallow edges of lakes.

BOTANICAL DESCRIPTION OF *CYPERUS ESCULENTUS*

IN STANDLEY AND CO-AUTHORS CHICAGO BOTANICAL MONOGRAPHS

Cyperus esculentus L. Sp. Pl. 45. 1753.

Zacapa, wet field near Zacapa, 200 meters; probably in other parts of Guatemala, but not collected. Southern Canada to Mexico and Panama; West Indies and South America; Old World tropics.

A glabrous perennial with long and very slender stolons, these terminating in globose or ovoid tubers; culms trigonous, 15-50 cm. tall, smooth; leaves numerous, about equaling the culms, 3-10 mm. wide, flat, smooth on the margins, the sheaths pale or reddish brown; bracts 2-6, longer or shorter than the inflorescence; rays of the umbel 5-10, simple or compound; spikelets distant in the spike, 5-24 in each spike, divaricate, linear, 6-30 mm. long, 1-3 mm. wide, when mature turgid and not compressed, 8-40-flowered; rachilla winged; scales 2.5-4 mm. long, pale brown, thin, 7-9-nerved, imbricate, slightly spreading at the apex, mucronulate; achene 1.5-2 mm. long, broadly oblong, trigonous, obtuse, not apiculate, light brown or grayish, lustrous, punctulate.

The English name is "chufa," the plant being sometimes cultivated for its hard but rather sweet and agreeably flavored tubers, which are eaten raw. It is probably the tubers of this species which are offered for sale in the markets of Quezaltenango, Totonicapan, and other places, under the name "sintule." The plant has not been noted in cultivation in Guatemala and the tubers are not common in the markets.

(Standley and Steyermark 1958: 122-123).

Photo by: María Alejandra Gutiérrez, FLAAR Mesoamerica, Apr. 25, 2021. Reserva Aldea Buena Vista, Tapón Creek, Livingston, Izabal.

Camera: Canon 1D X Mark II. Lens: Canon 50mm f/2.5 Macro 1:1 Settings: 1/1,600 sec; f/8; ISO 8,000.



CYPERUS IN THE MAYA LOWLANDS

Lake Peten has sedges *Cyperus articulatus* and *Cladium jamaicense* (Lundell 1937: VI). Lundell does not list any *Cyperus esculentus* but there are a lot of wetlands in Peten that need study by botanists who know wetlands plants inside out.

CYPERUS ESCULENTUS WETLAND PLANTS IN BELIZE: STANDLEY AND RECORD

Neither *Cyperus esculentus* nor any synonym is in the 1936 monograph on The Forests and Flora of British Honduras (1936: 74). Zero. This species is present in Belize but not in this book.

CYPERUS ESCULENTUS IN BELIZE (BALICK, NEE AND ATHA 2000)

There are about 25 species of *Cyperus* in Belize. Many are medicinal; but only one is edible:

Cyperus esculentus L. var. *esculentus* —
Reg Use: BEV, PRD, FOOD. — Habit: Herb.

(Balick, Nee and Atha 2000)



Photo by: María Alejandra Gutiérrez, FLAAR Mesoamerica, Apr. 25, 2021. Reserva Aldea Buena Vista, Tapón Creek, Livingston, Izabal.

Camera: Canon 1D X Mark II. Lens: Canon 50mm f/2.5 Macro 1:1 Settings: 1/1,600 sec; f/8; ISO 8,000.

BOTANICAL DESCRIPTION OF THE *CYPERUS ESCULENTUS* BY STANDLEY IN TREES AND SHRUBS OF MEXICO

No *Cyperus* is in the 1,721 pages of the five numbers of this book since it is focused on Trees and Shrubs.

BOTANICAL DESCRIPTION OF THE *CYPERUS ESCULENTUS* BY STANDLEY FOR YUCATAN

***Cyperus esculentus* L.**

Occasional. Inflorescence a 4-10-rayed umbel, the spikes golden brown, oblong, of 5-25 spreading spikelets; spikelets compressed, oblong, 10-15 mm. long, 2-2.5 mm. wide, 8-14-flowered.

(Standley 1930: 213)

Cyperus esculentus L. AGS, BCN, BCS, CAM, CHIS, CHIH, COAH, COL, CDMX, DGO, GTO, GRO, HGO, JAL, MEX, MICH, MOR, NAY, OAX, PUE, QRO, QROO, SLP, SIN, SON, TAB, TAMS, TLAX, VER, YUC, ZAC

(Villaseñor 2016: 715)

So found in all parts of Lowland Maya occupation: Chiapas, Tabasco, Campeche, Quintana Roo, and even Yucatan; so all parts of Mexico surrounding Guatemala:

CLOSE RELATIVE(S) OF *CYPERUS ESCULENTUS*

Eleocharis geniculata is such a close relative that several of its synonyms are almost the same name as *Cyperus esculentus*:

Eleocharis geniculata f. *brunnea* S.González & Reznicek

Eleocharis geniculata f. *geniculata*

Eleocharis geniculata var. *minor* (Vahl) Roem. & Schult.



Photo by: David Arrivillaga, FLAAR Mesoamerica, Apr. 25, 2021. Playa Aldea Buena Vista, Tapón Creek, Livingston, Izabal.

Camera: Sony Alpha A7R IV Lens: Sony FE 90mm Macro G OSS. Settings: 1/500 sec; f/11; ISO 2,500.

Here are all the synonyms for *Eleocharis geniculata*

Bulbostylis capitata (L.) Steven
Bulbostylis geniculatus (L.) Steven
Chlorocharis capitata (L.) Rikli
Chlorocharis geniculata (L.) Rikli
Cyperus capitatus (L.) Burm.f. ex B.D. Jacks. [Invalid]
Eleocharis brizantha Steud.
Eleocharis capitata (L.) R.Br.
Eleocharis capitata Miq.
Eleocharis capitata var. *dispar* (E.J.Hill) Fernald
Eleocharis caribaea (Rottb.) S.F.Blake
Eleocharis caribaea var. *achlamydea* Zavaro & Pabón
Eleocharis caribaea var. *dispar* (E.J.Hill) S.F.Blake
Eleocharis densisquamata Steud.
Eleocharis dispar E.J.Hill
Eleocharis geniculata f. *brunnea* S.González & Reznicek
Eleocharis geniculata f. *geniculata*
Eleocharis geniculata var. *minor* (Vahl) Roem. & Schult.
Eleocharis melanosperma Steud.
Eleocharis mexicana Peyr.
Eleocharis microformis Buckley
Eleocharis riparia Nees ex Spreng.
Eleocharis setacea R.Br.
Eleocharis singularis Steud.
Eleocharis sintenisii Boeckeler
Eleocharis valida Boeckeler
Eleogenus capitatus (L.) Nees
Eleogenus capitatus (L.) Nees ex Mart.
Eleogenus capitatus var. *intermedius* Nees
Eleogenus capitatus var. *major* Nees
Eleogenus capitatus var. *minor* Nees
Eleogenus capitatus var. *recurvus* Nees
Limnochloa constricta (Schrad. ex Kunth) Nees
Limnochloa densa Liebm.
Limnochloa geniculata (L.) Nees
Megadenus capitatus (L.) Raf.
Scirpus atrofactus Steud.
Scirpus brownii Spreng.
Scirpus capitatus L.
Scirpus caribaeus Rottb.
Scirpus constrictus Schrad. ex Kunth
Scirpus constrictus (Nees) Griseb.
Scirpus depressus Vell.
Scirpus geniculatus L.
Scirpus geniculatus var. *minor* Vahl
Scirpus interstinctus Poepp. ex C.Presl
Scirpus repens Willd. ex Schult.
Scirpus validus (Boeckeler) Kuntze [Illegitimate]
Trichophyllum capitatum (L.) House

(www.theplantlist.org/tpl1.1/record/kew-242508)



Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Mar. 25, 2021. Rio Bonito, south of El Golfete, Livingston, Izabal.

Camera: Nikon D810. Lens: Nikon AF-S VR Micro-NIKKOR 105mm IF-ED. Settings: 1/400 sec; f/14; ISO 1,280.

WHERE HAS *CYPERUS ESCULENTUS* BEEN FOUND IN THE MUNICIPIO OF LIVINGSTON?

Is *Cyperus esculentus* listed for Biotopo Protegido Chocón Machacas, CECON/USAC?

Cyperus surinamensis is mentioned in list of recorded species (PEREZ-Consuegra, Sergio, et al 2001).

Is *Cyperus esculentus* listed for Tapon Creek Nature Reserve (including Taponcito Creek), FUNDAECO?

Not mentioned

Is *Cyperus esculentus* listed for Buena Vista Tapon Creek Nature Reserve?

Not mentioned

Is *Cyperus esculentus* listed for Cerro San Gil (south side of Rio Dulce)?

Not mentioned

Is *Cyperus esculentus* listed for Ecoalbergue Lagunita Creek (Área de Usos Múltiples Río Sarstún)?

Not mentioned

Is *Cyperus esculentus* listed for El Refugio de Vida Silvestre Punta de Manabique?

Cyperus haspan is mentioned in the vegetation inventory with 14 other species of the family Cyperaceae (CONAP 2001).

Is *Cyperus esculentus* listed for Sarstoon-Temash National Park (northern side of Río Sarstún)?

Not mentioned



Photo by: Nicholas Hellmtuh, FLAAR Mesoamerica, Mar. 25, 2021. Rio Bonito, south of El Golfete, Livingston, Izabal.

Camera: Nikon D810. Lens: Nikon AF-S VR Micro-NIKKOR 105mm IF-ED. Settings: 1/400 sec; f/14; ISO 1,280.

Edible Plants of Municipio de Livingston from

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Is *Cyperus esculentus* listed for Bocas de Polochic?

Not mentioned

Sierra Santa Cruz Special Protection Area (Subcuenca Río Sumachen)
In the flora list of the environmental management plan USAC. (SALGUERO, Juana 2011)

Is *Cyperus esculentus* from the Highlands or from the Lowlands (or both)?

Both, from 0 to 3000 MASL

<http://enciclovida.mx>

WORLD RANGE FOR *CYPERUS ESCULENTUS*

“All around the world” since it originated “millions of years ago” in Africa and is now pan-tropical.



Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Mar. 25, 2021. Rio Bonito, south of El Golfete, Livingston, Izabal.

Camera: Nikon D810. Lens: Nikon AF-S VR Micro-NIKKOR 105mm IF-ED. Settings: 1/400 sec; f/14; ISO 1,280.

DOES *CYPERUS ESCULENTUS* ALSO GROW IN HOME GARDENS?

This is considered a weed and would unlikely be featured in a garden.

USES OF *CYPERUS ESCULENTUS* AND *ELEOCHARIS CARIBAEA*

Cyperus esculentus L. var. *esculentus* —
Reg Use: BEV, PRD, FOOD. — Habit: Herb.

(Balick, Nee and Atha 2000)

Eleocharis caribaea is a synonym for *Eleocharis geniculata*

Eleocharis caribaea (Rottb.) Blake, *Rhodora* 20: 24. 1918. Tule, sintule.

In Guatemala a beverage, to which other substances may be added, is made from the thick roots of this plant.

(Williams 1981: 104).

So, it appears that in Guatemala people were already making, on their own, what is similar to the horchata made in Spain (by the TON since the 13th century) and consumed by the (thousands of liters) as “horchata de chufa” (tiger nut milk) (Sanchez et al. 2009 and Djombi et al. 2020).

Cyperus papyrus L. is the most famous sedge because it was used to make papyrus paper for thousands of years. But this species is not in the Americas.



Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Mar. 25, 2021. Rio Bonito, south of El Golfete, Livingston, Izabal.

Camera: Nikon D810. Lens: Nikon AF-S VR Micro-NIKKOR 105mm IF-ED. Settings: 1/400 sec; f/14; ISO 1,280.

IS THERE POTENTIAL MEDICINAL USAGE OF *CYPERUS ESCULENTUS* BY LOCAL PEOPLE?

Tigernut tubers have a certain antioxidant capacity, partly due to their polyphenol content, but probably also due to their content of compounds such as tocopherol and ascorbic acid; also has the ability to stimulate the activity of angiotensin-I converting enzyme, which could lead to an increase in blood pressure, which could be used in cases of hypotension (PAZCUAL and PAZCUAL-ZERVA 2016).

In Asian countries, the rhizomes of *C. rotundus*, which are used as traditional folk medicines for the treatment of stomach and bowel disorders, and inflammatory diseases, have been widely investigated. *C. rotundus* is a traditional herbal medicine used widely as analgesic, sedative, antispasmodic, antimalarial, stomach disorders and to relieve diarrhea. The tuber part of *C. rotundus* is one of the oldest known medicinal plants used for the treatment of dysmenorrhoeal and menstrual irregularities. Infusion of this herb has been used in pain, fever, diarrhoea, dysentery, an emmenagogue and other intestinal problems. It is a multipurpose plant, widely used in traditional medicine around the world to treat stomach ailments, wounds, boils and blisters (SIVAPALAN 2013).



Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Mar. 25, 2021. Rio Bonito, south of El Golfete, Livingston, Izabal.

Camera: Nikon D810. Lens: Nikon AF-S VR Micro-NIKKOR 105mm IF-ED. Settings: 1/400 sec; f/14; ISO 1,280.

ARE ANY PARTS OF *CYPERUS ESCULENTUS* EATEN BY MAMMALS?

Some animals like cows and horse feed on this plant but it is not essential for these animal species (ALEMAN-Zelédon 2012).

WHAT ARE THE PRIMARY POLLINATORS OF *CYPERUS ESCULENTUS* FLOWERS?

Pollination is anemophilous, usually self-incompatible (PAZCUAL and PAZCUAL-ZERVA 2016).



Photo by: David Arrivillaga, FLAAR Mesoamerica, Apr. 25, 2021. Playa Aldea Buena Vista, Tapón Creek, Livingston, Izabal.

Camera: Sony Alpha A7R IV Lens: Sony FE 90mm Macro G OSS. Settings: 1/500 sec; f/11; ISO 2,500.

CONCLUDING DISCUSSION AND SUMMARY ON *CYPERUS ESCULENTUS* SEDGES

So now we know (tongue in cheek) that the Classic Maya had three sources of “milk” even though they did not have cows:

- Two species of leche de vaca tree whose latex is literally like creamy milk (both of which we have found and documented in the Municipio de Livingston, Izabal, Guatemala)
- And now “horchata de chufa” (tiger nut milk)

Since it is known that *Cyperus esculentus* originated in Africa and other parts of the world, I am writing the present report based on an estimate that it spread around the world thousands of year ago (De Castro 2014) (so before the arrival of the Spaniards, who had horchata milk since the 13th century). Fedick (2010: 953) mentions pollen of *Cyperus esculentus* at Copan.



Photo by: María Alejandra Gutiérrez, FLAAR Mesoamerica, Mar. 25, 2021. Rio Bonito, El Golfete, Livingston, Izabal.

Camera: Canon 1D X Mark II. Lens: Canon 50mm f/2.5 Macro 1:1 Settings: 1/8,000 sec; f/8; ISO 5,000.

We have a lot more to learn about reeds, grasses, and sedges of the wetlands of the Maya Lowlands and Highlands:

Luzulae (L.) Retz.

A weedy plant, common in many localities. The stems are much used as a substitute for twine. A decoction of the root is drunk in Huehuetenango with atol de maiz, often flavored with toasted seeds of sapote.

We all know the Maya made “bark paper” for their codices. But there are actually several other plants of Mesoamerica that can produce paper. Plus:

Cyperus prolixus HBK. Nov. Gen. & Sp. 1: 206. 1816. Marshes and open swamps, ranging from sea level to about 1500 meters; Alta Verapaz; Izabal; Guatemala; reported by Hemsley from San Geronimo and Volcan de Fuego; collected by Godman and Salvin. Southern Mexico; Costa Rica and Panama; South America. The plant is abundant in many places in the lowlands of Izabal, where it forms almost pure stands of considerable extent. In general appearance it is much like the papyrus of the Nile.

(Standley and Steyermark 1958: 135).

Cyperus prolixus Kunth is an accepted name.

We have edible *Cyperus* and potentially other uses. Let’s hope a student will be inspired to tackle each of these *Cyperus* species as a thesis, or all three together as a PhD dissertation.



Photo by: María Alejandra Gutiérrez, FLAAR Mesoamerica, Mar. 25, 2021. Rio Bonito, El Golfete, Livingston, Izabal.

Camera: Canon 1D X Mark II. Lens: Canon 50mm f/2.5 Macro 1:1 Settings: 1/1,250 sec; f/7.1; ISO 5,000.

APPENDIX A

List of all species of genus *Cyperus* in Izabal in Standley and Steyermark 1958

The following is for *Cyperus* in Izabal. If your own project is on *Cyperus* in Peten, a good place to start is The Vegetation of Peten (Lundell 1937). We spent months scanning every page in this book and correcting each word by hand, so we have an open pdf of this monograph. But in the meantime, here is the information for our current report, on the Municipio de Livingston, Izabal, Guatemala.

No.	<i>Cyperus</i> for Belize	<i>Cyperus</i> listed for Izabal by Standley and Steyermark 1958	<i>Cyperus</i> for Muni Livingston nature reserves and nearby (Bocas de Polochic, Manabique, etc.)
1	<i>Cyperus aggregatus</i> (accepted) <i>Cyperus flavus</i> (synonym)		
2	<i>Cyperus articulatus</i>		
3	<i>Cyperus articulatus</i> L. var. <i>nodosus</i>		
4	<i>Cyperus compressus</i>	<i>Cyperus compressus</i>	
5		<i>Cyperus diffusus</i>	
6	<i>Cyperus digitatus</i>		
7		<i>Cyperus Eggersii</i>	
8	<i>Cyperus elegans</i>		
9	<i>Cyperus esculentus</i>		
10	<i>Cyperus giganteus</i>		

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Swamps, Marshes, and Seasonally Inundated Flatlands of Izabal

11	<i>Cyperus haspan</i>	<i>Cyperus haspan</i>	<i>Cyperus haspan</i>
12	<i>Cyperus hermaphroditus</i>	<i>Cyperus hermaphroditus</i>	
13	<i>Cyperus humilis</i>		
14	<i>Cyperus imbricatus</i>	<i>Cyperus imbricatus</i>	
15	<i>Cyperus involucratus</i>		
16	<i>Cyperus iria</i>		
17	<i>Cyperus ischnos</i>		
18	<i>Cyperus laxus</i>		
19	<i>Cyperus lentiginosus</i>		
20	<i>Cyperus ligularis</i>	<i>Cyperus ligularis</i>	
21	<i>Cyperus luzulae</i>	<i>Cyperus Luzulae</i>	
22	<i>Cyperus mutisii</i>		
23	<i>Cyperus ochraceus</i>		
24		<i>Cyperus odoratus</i>	
25	<i>Cyperus planifolius</i>		
26	<i>Cyperus prolixus</i>	<i>Cyperus prolixus</i>	
27	<i>Cyperus rotundus</i>	<i>Cyperus rotundus</i>	
28	<i>Cyperus surinamensis</i>	<i>Cyperus surinamensis</i>	<i>Cyperus surinamensis</i>
29	<i>Cyperus tenuis</i>	<i>Cyperus tenuis</i>	

Cyperus compressus L. is an accepted name:

Cyperus compressus L. Sp. Pl. 46. 1753.

Moist open slopes, damp thickets, or in wet sand near streams, at 900 meters or less; Peten Izabal; Zacapa; Chiquimula; Jutiapa; Escuintla; Suchitepequez; Solola. United States to Mexico, British Honduras, and Panama; West Indies; South America; Old World tropics.

A low glabrous annual with fibrous roots, the culms mostly 5-15 cm. tall, about 1 mm. thick, smooth; leaves 1-4 at the base of the culm, about equaling the culm, 1.5-3 mm. wide, sometimes minutely scaberulous on the margins, the sheaths purplish brown; bracts 3-5, unequal, 1-3 mm. wide; rays of the umbel simple, 1-12 cm. long; spikelets in digitate clusters of 3-10, linear-oblong, 10-24 mm. long, 2-3 mm. wide, acute, compressed, the rachilla winged; scales firm, closely imbricate, ovate, 3-3.5 mm. long, acuminate and mucronate, the tips somewhat excurved, 9-13-nerved, green, the margins broadly white-hyaline; achene obovoid, trigonous, 1-1.3 mm. long, dark brown and shining, minutely punctulate, subemarginate at the apex.

(Standley and Steyermark 1958: 120)

Cyperus diffusus Vahl is an accepted name:

Cyperus diffusus Vahl, Enum. Pl. 2: 321. 1806. *C. toluensis* HBK. Nov. Gen. & Sp. 1: 206. 1815. *C. umbrosus* Lindl. & Nees in Mart. Fl. Bras. 2, pt. 1: 31. 1842. *C. diffusus* var. *umbrosus* Kuekenth. Pflanzenreich IV. 20: 210. 1936. *C. diffusus* var. *toluensis* Kuekenth. op. cit. 211. 1936. Junquillo.

Wet thickets or shaded banks, often in moist forest, rarely in open places, 1300 meters or less, most common at low elevations; Alta Verapaz; Izabal; Santa Rosa; Escuintla; Suchitepequez; Retalhuleu; Quezaltenango; San Marcos. Mexico to British Honduras and Panama; West Indies; South America; tropical Asia and Malaysia.

Plants perennial, glabrous, with short slender rhizomes, the slender or stout culms 20-50 cm. tall, about 1.5 mm. thick, trigonous, smooth; leaves 2-7 to

each culm, shorter than or about equaling the culm, 3-9 mm. wide, flat, rough-margined, the sheaths reddish brown; bracts 5-8, unequal, 1-9 mm. wide; rays of the umbel 8-12, unequal, branched; spikelets solitary or in heads of 2-3, ovate to oblong, 4-10 mm. long, 1.5-2 mm. wide, green or pale green, 5-10-flowered, the rachilla not winged; scales ovate, membranous, 2-3 mm. long, cuspidate-mucronate, 7-9- nerved; achene 1.4 mm. long, trigonous-obovoid, dark brown, smooth, substipitate.

A common weedy plant in lowland thickets of Guatemala, as well as in Central America generally. It is one of the commonest *Cyperus* species of Central America. Of the varieties and subspecies proposed by Kuekenenthal the Guatemalan material, according to O'Neill, is referable to var. *tolucensis* (HBK.) Kuekenenthal.

(Standley and Steyermark 1958: 120-121).

Cyperus eggersii Boeckeler is a synonym of *Cyperus odoratus* subsp. *odoratus*:

Cyperus Eggersii Boeckel. Gyp. Nov. 1: 53. 1888.

Wet or marshy soil, often along streams; Izabal; Peten. Texas to Campeche and British Honduras; Honduras; West Indies; Ecuador.

A coarse perennial, glabrous, with a very short, stout rhizome, the culms 20-90 cm. tall, 2-3 mm. thick at the apex, obtusely trigonous, sometimes rough on the angles; leaves 4-6 to a culm, 5-15 mm. wide, 12-60 cm. long, subcoriaceous, roughmargined, the sheaths reddish brown; bracts 5-8 and 4-10 mm. wide; umbel with 5-10 rays, these unequal, usually short, with 3-5 ovate or ovate-cylindric spikes congested into a dense head; spikelets numerous, oblong or linear-lanceolate, 6-10 mm. long, about 1 mm. wide, suberect, subterete, 3-9-flowered, the rachilla breaking up into 1-flowered joints; scales 2 mm. long, ovate, obtuse, sometimes mucronulate, clasping the achene, stramineous or lustrous brown; achene oblong, 1.2 mm. long and half as wide, obtusely trigonous, very shortly stipitate, minutely punctulate, apiculate, yellowish brown.

This is closely related to *C. macrocephalus*, from which it may not be more than varietally distinct.

(Standley and Steyermark 1958: 121-122).

Cyperus haspan L. is an accepted name:

Cyperus haspan L. Sp. Pl. 45. 1753. *C. juncooides* Lam. 111. 1: 147. 1791. *C. haspan* subsp. *juncooides* Kuekenth. Repert. Sp. Nov. 23: 184. 1926. Wet savannas, marshes, or bogs, sometimes along streams or in ditches, ascending from sea level to 1500 meters; Alta Verapaz; Izabal; Chiquimula; Jalapa; Jutiapa; Santa Rosa. Southern United States to Mexico, British Honduras, and Panama; West Indies; South America; Old World tropics.

Plants glabrous, annual or perennial, with short rhizomes or only fibrous roots, the culms subcespitose, 20-60 cm. tall, 2-3 mm. wide at the apex, compressed trigonous to 3-winged, rather soft and weak; leaves reduced to a few purplish brown sheaths at the base of the culm, very rarely with blades; bracts 2, unequal, 1-5 cm. long; rays of the umbel very unequal, usually compound, the spikelets clustered at the ends of the raylets, linear, acute, 4-10 mm. long, 1 mm. wide, compressed, 6-30-flowered, the rachilla straight, not winged, the achenes and stamens persistent after the glumes have fallen; scales 1-1.5 mm. long, oblong-ovate, obtuse, sometimes minutely mucronulate, reddish, thin, 3-nerved; achene rounded trigonous, 0.5 mm. long, subglobose, stipitate, verrucose, scarcely apiculate.

Kuekenthal refers all American material to subsp. *juncooides*, but this is separated from Old World plants by doubtfully distinct characters.

(Standley and Steyermark 1958: 125).

Cyperus hermaphroditus (Jacq.) Standl. is an accepted name:

Cyperus hermaphroditus (Jacq.) Standl. Contr. U. S. Nat. Herb. 18: 88. 1916. *Carex hermaphrodita* Jacq. Coll. Bot. 4: 174. 1790. *Mariscus Jacquini* HBK. Nov. Gen. & Sp. 1: 216. 1815. *Cyperus alpinus* Liebm. Vid. Selsk. Skrivt. V. 2: 215. 1851. Coyolito. Damp or wet thickets, fields, or forest, often in sand along streams or a weed in cultivated ground, ascending from sea level to about 2600 meters; Peten; Alta Verapaz; reported from Izabal; Zacapa; Chiquimula; Jalapa; Jutiapa; Santa Rosa; Escuintla; Sacatepequez; Chimaltenango; Suchitepequez; Solola; Retalhuleu; Quezaltenango; San Marcos; Huehuetenango. Mexico and

British Honduras to Panama; South America.

A glabrous perennial with short rhizomes, the culms 15-75 cm. tall, 1-2 mm. thick at the apex, trigonous, smooth, often tuberous-thickened at the base; leaves 3-9 to a culm, 3-7 mm. wide, flat, scaberulous on the margins, the sheaths purplish brown; bracts 5-8, unequal, 2-7 mm. wide; rays 12 or fewer, 12 cm. long or less, sometimes wanting, often branched, the spikes 1-3 cm. long, 1-1.5 cm. broad, dense or lax, usually cylindrical; spikelets numerous, 5-10 mm. long, 1 mm. wide, oblong-lanceolate, somewhat tetragonous, usually divaricate, 3-7-flowered, the lowest sometimes reflexed, the rachilla winged; scales 2.5-3.5 mm. long, ovateelliptic, appressed, thin, obtuse or submucronate, many-nerved, yellowish to golden brown; achene 1.2-1.8 mm. long, trigonous, oblong-ellipsoid, not stipitate, minutely apiculate.

(Standley and Steyermark 1958: 125-126)

Cyperus imbricatus Retz. is an accepted name:

Cyperus imbricatus Retz. Obs. Bot. 5: 12. 1789. *C. radiatus*

Vahl, Enum. Pl. 2: 369. 1806. *C. radiatus* var. *elongatus* Boeckel. Linnaea 36: 319. 1870. Shallow water at edge of lake, forming large colonies, Lago de Atescatempa, Jutiapa, 500 meters; reported from mouth of Rio Polochic, Izabal. Mexico; Costa Rica; West Indies; South America; Old World tropics. Plants perennial, robust, glabrous, with very short, ligneous rhizomes, the culms about a meter tall, trigonous, smooth, leafy at the base; leaves shorter than culms, coriaceous, 4-8 mm. wide, the sheaths fuscous; bracts 3-5, equaling or longer than the inflorescence; rays of the umbel 6-8, compound, the spikes corymbosefasciculate, sessile or subsessile, cylindrical, dense, 1-3 cm. long, 4-8 mm. wide; spikelets numerous, crowded, suberect, oblong-lanceolate or linear-lanceolate, 3-6 mm. long, about 1 mm. wide, subcompressed, 10-20-flowered, the rachilla narrowly winged; scales 1.2 mm. long, closely imbricate, broadly ovate, obtuse, membranaceous, pale ferruginous, 3-5-nerved, terminating in a short excurved mucro; achene half as long as the glume, ovoid or ellipsoid, compressed-trigonous, stramineous, lustrous, scarcely apiculate.

(Standley and Steyermark 1958: 126-127)

Cyperus ligularis L. PL Jam. Pugill. 3. 1759. Tul coyolillo.

Wet fields or banks, especially in salt flats near the seacoast, ascending to about 1170 meters (Lago de Amatitlan); Izabal; Chiquimula; Escuintla; Guatemala; Retalhuleu; San Marcos. Florida and Alabama and Mexico to British Honduras and Panama; West Indies; South America; Old World tropics. A coarse stout perennial with short thick rhizomes, the culms stout and stiff, 30-90 cm. tall, trigonous, 2-5 mm. thick at the apex, papillose; leaves longer than the culm or shorter, 5-20 mm. wide, thick, septate-nodulose, papillose, very rough on the margins and costa, pale when dried, the sheaths reddish brown; bracts 5-12, unequal, 5-15 mm. wide; rays of the umbel 5-12, unequal, branched, usually short, the spikes 3-7 in a dense cluster, 1.5-2.5 cm. long, 10-12 mm. wide; spikelets very numerous, 2-6-flowered, turgid, subterete, 3-7 mm. long, 2-2.5 mm. wide, divaricate or the lower reflexed, the rachilla zigzag, winged; scales 2-2.5 mm. long, ovate, apiculate, 9-11-nerved, brown or stramineous with reddish brown striations, lustrous; achene 1.2-1.4 mm. long, trigonous, obovoid-ellipsoid, brown, apiculate, punctulate, substipitate. This isolated species grows most often in brackish soil, but not invariably. In British Honduras it receives the name of "cutting grass."

(Standley and Steyermark 1958: 128)

Cyperus luzulae (L.) Retz. is an accepted name:

Cyperus luzulae (L.) Retz. Obs. Bot. 4: 11. 1786. Scirpus

Luzulae L. Sp. PL ed. 2. 75. 1762. *C. guatemalensis* Gandoger, Bull. Soc. Bot. France 66: 297. 1919 (type from Alta Verapaz, collected by Tuerckheim, probably at Cubilgliitz). Cebollin; Cebolla de rio; Sivac (Coban); Suchipaite (Huehuetenango). Marshes and swamps, wet fields, or along streams, ranging from sea level to about 1400 meters, most common at low elevations; Peten; Alta Verapaz; Izabal; Retalhuleu; Suchitepequez; Huehuetenango; Quezaltenango; San Marcos. Mexico and British Honduras to Panama; West Indies; South America. A glabrous perennial with short rhizomes, the culms usually cespitose, stout, 20-50 cm. tall, obtusely trigonous; leaves 5-12 to a culm, 10-40 cm. long, 3-8 mm. wide, flat, rough-margined, the sheaths

reddish brown; bracts 7-11, the rays of the umbel 6-12, the few spikes at the ends forming dense ovoid heads 6-15 mm. broad; spikelets ovate to oblong-ovate, 2.5-4 mm. long, 2 mm. wide, compressed, 6-16-flowered, the rachilla not winged; scales 1.2-1.5 mm. long, ovate or oblong-ovate, incurved, submucronate, obsoletely 3-nerved, white or yellowish; achene 1 mm. long, trigonous, linear-oblong, acuminate, scarcely stipitate, minutely punctulate, subapiculate.

A weedy plant, common in many localities. The stems are much used as a substitute for twine. A decoction of the root is drunk in Huehuetenango with atol de maiz, often flavored with toasted seeds of sapote.

(Standley and Steyermark 1958: 129).

Cyperus odoratus L. is an accepted name:

Cyperus odoratus L. Sp. PL 46. 1753. *C. ferax* L. Rich. Act.

Soc. Hist. Nat. Paris 1: 106. 1792. *C. Haenkei* Presl, Reliq. Haenk. 1: 172. 1830. Navajuela; Saichd (Coban, Kekchi).

Usually in wet soil, thickets or waste ground, often along streams or ditches, marshes and wet fields, most common at low elevations, but ascending to about 1500 meters; Alta Verapaz; Izabal; Zacapa; Jutiapa; Santa Rosa; Escuintla; Guatemala; Retalhuleu; Quezaltenango. United States to Mexico, British Honduras, and Panama; West Indies; South America; Old World tropics. A glabrous perennial with short rhizomes, the culms stout, 30-100 cm. tall, 3-5 mm. thick at the apex, smooth; leaves 3-5 to a culm, 10-60 cm. long, 4-12 mm. wide, subcoriaceous and rather rigid, scaberulous on the margins, the sheaths stramineous or brown; bracts 6-8, elongate; rays of the umbel 6-12, short or elongate, compound, the spikes 2-3 cm. long and 1-2.5 cm. wide; spikelets mostly rather distant and lax, divergent or reflexed, linear, 5-15 mm. long, 1 mm. wide, subterete, 3-15-flowered, the rachilla readily breaking up into 1-fruited joints, winged; scales 2-3.5 mm. long, broadly ovate to ovate-elliptic, closely imbricate, appressed and enclosing the achenes, brownish or reddish-stramineous, obsoletely 7-9-nerved;

achene 1-1.5 mm. long, oblong or obovoid-oblong and trigonous, brown to black, substipitate, apiculate, minutely punctulate. Called "coyolillo" in El Salvador and probably also in Guatemala, the name alluding to a fanciful resemblance of the plant to a diminutive coyol palm (*Acrocomia*). This is a weedy plant and probably the most abundant *Cyperus* species of Central America.

(Standley and Steyermark 1958: 132).

Cyperus prolixus Kunth is an accepted name

Cyperus prolixus HBK. Nov. Gen. & Sp. 1: 206. 1816.

Marshes and open swamps, ranging from sea level to about 1500 meters; Alta Verapaz; Izabal; Guatemala; reported by Hemsley from San Geronimo and Volcan de Fuego; collected by Godman and Salvin. Southern Mexico; Costa Rica and Panama; South America. Plants perennial, large and coarse, with thick rhizomes, the culms commonly 1-1.5 meters tall, obtusely trigonous, spongy-thickened at the base, leafy below; leaves equaling or longer than the culms, 8-20 mm. wide, flat, septate-nodulose, rough-margined; bracts 6-10, longer than the inflorescence; umbels decomposed or even thrice branched, lax, large, with numerous rays, these as much as 30 cm. long; spikes rather dense, with numerous spikelets, oblong-elliptic; spikelets suberect, linear or linear-lanceolate, 15-20 mm. long, 1.5-2 mm. wide, acute, compressed, 10-14-flowered, the very slender rachilla flexuous, winged; scales rather remote, patulous at the apex in fruit, oblong-elliptic, obtuse, 4mm. long, often short-mucronate, dirty-stramineous, 5-7-flowered, ferruginous-lineolate between the nerves; achene one-half to three-fifths as long as the glume, trigonous, narrowly oblong, dark brown, lustrous, densely punctulate, short-apiculate.

The plant is abundant in many places in the lowlands of Izabal, where it forms almost pure stands of considerable extent. In general appearance it is much like the papyrus of the Nile.

(Standley and Steyermark 1958: 135).

Cyperus rotundus L. is an accepted name:

Cyperus rotundus L. Sp. Pl. 45. 1753. Coyolillo. Figure 25.

Wet fields or along streams, sometimes in lawns or pastures, chiefly at low elevations but ascending to possibly 1500 meters; Izabal; Zacapa; Guatemala. United States and Mexico to British Honduras and Panama; West Indies; South America; Old World tropics.

A low perennial with long stolons ending in small tubers, the culms slender, 15-50 cm. tall, 1-1.5 mm. thick at the apex, triquetrous, smooth; leaves 5-12 to a culm, about equaling the culms, flat, 3-6 mm. wide, smooth on the margins, the sheaths reddish brown; bracts 2-4, longer or shorter than the inflorescence; rays of the umbel 3-8, usually simple, sometimes compound, 9 cm. long or less; spikelets 2-12 in each spike, lax, linear, compressed, 4-40 mm. long, 1-2.5 mm. wide, 12-36-flowered, the rachilla winged; scales imbricate, ovate, obtuse, thin, 3-3.5 mm. long, reddish brown, the keel green, 7-nerved, scarcely mucronate; achene 1.5-2 mm. long, obovoid or ellipsoid, black and shining, scarcely apiculate, minutely punctulate.

On the North Coast this species is often a weed in flower beds, gardens, and other cultivated ground.

(Standley and Steyermark 1958: 136).

Cyperus surinamensis Rottb. is an accepted name

Cyperus surinamensis Rottb. Descr. & Icon. 35. 1773. *C. surinamensis* var. *lutescens* Boeckl. Linnaea 35: 555. 1868. Coyolillo.

Wet fields and thickets, swamps, stream and lake margins, often in sand flats along streams, chiefly at less than 1000 meters, rarely ascending to 1800 meters; Izabal; Zacapa; Chiquimula; Jalapa; Jutiapa; Santa Rosa; Escuintla; Guatemala; reported from Sacatepequez; Chimaltenango; Huehuetenango; San Marcos. Florida to Texas, Mexico, British Honduras, and Panama; West Indies; South America.

A glabrous perennial with short thick rhizomes, the culms stout, 10-60 cm. tall, 1 mm. thick at the apex, trigonous, downwardly scabrous on the angles; leaves 2-6 to a culm, about equaling the culms, 1-3 mm. wide, flat or conduplicate, bright. green, rough-margined, the sheaths purplish or brownish; bracts 5-7, very unequal, the rays of the umbel 5-7 and 7 cm. long or less, sometimes compound; spikelets congested in dense heads, numerous, oblong or linear, 3-14 mm. long, 2 mm. wide, strongly compressed, the rachilla not winged; scales 1-1.5 mm. long, ovate, acute or minutely apiculate, cellular-reticulate, stramineous, 3-nerved; achene 0.6 mm. long, narrowly ovoid-oblong, obtusely trigonous, faintly transverse-rugulose, minutely punctulate, short-apiculate, reddish brown.

(Standley and Steyermark 1958: 139).

Cyperus tenuis Swartz, Prodr. Veg. Ind. Occ. 20. 1788. *C. caracasanus* Kunth, Enum. Pl. 2: 86. 1837. Zumbidor (Santa Rosa).

Wet or damp fields or thickets, often on sand or gravel bars, 1400 meters or less, chiefly at low elevations; Peten; Alta Verapaz; Izabal; Zacapa; Santa Rosa; Escuintla; Suchitepe'quez; Quezaltenango; San Marcos. Mexico and British Honduras to Panama; West Indies; South America; west Africa. A glabrous perennial with short rhizomes, the culms cespitose, 10-50 cm. tall, 1-1.5 mm. thick at the apex, trigonous, smooth; leaves 3-5 to a culm, 5-30 cm. long, 2-3 mm. wide, flat, rough-margined, the sheaths reddish purple; bracts 5-9, longer than the inflorescence; rays of the umbel 5-12, simple, 9 cm. long or less, the spikes 1.5-2 cm. long, 1-2.5 cm. wide; spikelets rather dense or remote, linear, 5-15 mm. long, 3-8-flowered, the rachilla winged; scales 3-3.5 mm. long, oblongelliptic, obtuse mucronulate, closely appressed, 7-11-nerved, greenish white to brown, with hyaline margins; achene 1.5-2 mm. long, trigonous, oblong-ellipsoid, brown, somewhat falcate, substipitate, scarcely apiculate, punctate, dull.

Called "coyolillo" in El Salvador.

(Standley and Steyermark 1958: 139-140).

REFERENCES CITED AND SUGGESTED READING ON *CYPERUS ESCULENTUS*

Most helpful monographs on this plant:

There is no monograph on Genus *Cyperus* that we have yet found. These trees certainly deserve more attention in Guatemala and adjacent countries.

Note: since the present edition is a work-in-progress this bibliography also is a work-in-progress

ALEMAN-Zelédon, Frebdy

2012 Flora Arvense y Ruderal del Pacífico y Centro de Nicaragua. Universidad Nacional Agraria. 272 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. 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.

AZURDIA, César

2016 Plantas Mesoamericanas Subutilizadas en la Alimentación Humana, El Caso de Guatemala: una revisión del pasado hacia una solución actual. Consejo Nacional de Áreas Protegidas (CONAP)

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.

BALICK, Michael J. and Rosita ARVIGO

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..2001 Plan Maestro 2002-2006 Área de Protección Especial Punta de Manabique. CONAP. Fundación Mario Dary Rivera. Guatemala.

COOK, Suzanne

2016 The forest of the Lacandon Maya: an ethnobotanical guide. Springer. 334 pages.

Sold online: www.springer.com/la/book/9781461491101

DIX, Margaret A. and M. W. DIX

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

This is one of the sources for the tree list portion of CONAP 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.

DJOMDI, Djombi, HAMADOU, Bakari, GIBERT, Olivier, TRAN, Thierry, DELATTRE, Cedric, PIERRE, Guillaume, MICHAUD, Philippe, EJOH, Richard and Robert ND-JOUENKEU

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FEDICK, S. L.

2010 The Maya Forest: destroyed or cultivated by the ancient Maya? Proceedings of the National Academy of Sciences, USA 107: 953–954.

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

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2007 Propuesta de Incorporación a la Convención Ramsar del Área Protegida “Reserva de Usos Múltiples Río Sarstún”. FUNDAECO.

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

HELLMUTH, Nicholas M.

2013 Maya Ethnobotany, Complete Inventory, Fruits, nuts, root crops, grains, construction materials, utilitarian uses, sacred plants, sacred flowers 12th edition. FLAAR Reports, FLAAR (USA) and FLAAR Mesoamerica (Guatemala). 106 pages.

The 13th edition that followed is an update but the 12th edition has tons of material to get you started.

HELLMUTH, Nicholas M.

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- 2013 Medicinal uses and Pharmacological activities of *Cyperus rotundus* Linn – A Review. International Journal of Scientific and Research Publications, Volume 3, Issue 5, May 2013, 8 pages. University of Jaffna, Sri Lanka.

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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.

- 1930 Flora of Yucatan. Botanical Series, Vol. III, No. 3, Publication 279. Field Museum of Natural History.

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1981 Foods for Early Man. CEIBA, Vol. 24 Núm. 1-2, Escuela Agrícola Panamericana, Zamorano.

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/imagetdatabase/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.

WEB PAGES SPECIFICALLY ON *CYPERUS ESCULENTUS* TREES

<http://arbolesdelchaco.blogspot.com/2017/02/croton22.html>

General information.

www.backyardnature.net

Jim Conrad's helpful web site, as usual, photos better than most other web pages.

www.cicy.mx/

Species list

www.inriodulce.com

A helpful web site for visitors for Rio Dulce. Species names have changed; best to feature the accepted name and list the synonyms..

<https://naturalezatropical.com/>

Information and cultivation.

<http://www.theplantlist.org>

Shows which are Accepted and which are Synonyms.

www.youtube.com/watch?v=RcQAINbP9NE

How to eat and how to make milk out of *Cyperus esculentus*.

LIVINGSTON: THE CARIBBEAN BIODIVERSITY WONDERLAND OF GUATEMALA

Izabal, one of the regional departments of Guatemala that offers a variety of recreational activities, is home to numerous nature parks and diverse natural landscapes. There are white sandy beaches a short boat trip away, with tall jungle-covered mountains in the background, and the Mesoamerican Reef System in the Caribbean Sea on the horizon in front of you. Mangrove swamps, seagrass, islands, cenotes, caves, karst geology canyons and streams of crystal clear water abound along the Rio Dulce and Lake Izabal coast or inland. All this together makes Livingston one of the destinations for tourists wanting to do bird-watching, explore caves, and get healthy exercise hiking through trails in the rainforest. In addition to the incredible flora and fauna that the municipality offers, three different cultures coexist in the ecosystem (Mayan Q'eqchi', Garifuna and Ladinos).

In order to conserve the biodiversity found in the municipality and that continues to be of benefit to the ecosystem, it is necessary to have an updated record of the species that inhabit it and thus be able to detect changes in the species population. Thanks to the efforts of different institutions focused on environmental improvement projects at various sites in Livingston (FUNDAECO working in Río Sarstun, CONAP covering Río Dulce, CECON-USAC in Chocón-Machacas, and ARNPG with more than ten private reserves, among many others) are records of species of flora, fauna and ecosystems of this municipality of Izabal.

Using this information in the most efficient way and using the potential of digital technology, the database for the municipality can be supplemented with photographic records of flora, fauna, and ecosystems. The FLAAR Mesoamerica team, in cooperation with the municipal authorities, have begun to produce this educational material using the photographic records generated during the cooperation project to account for the flora, fauna and ecosystems that can be seen in Livingston. This will be accomplished in order to provide information to schools, families and institutions already working to protect the environment.

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.



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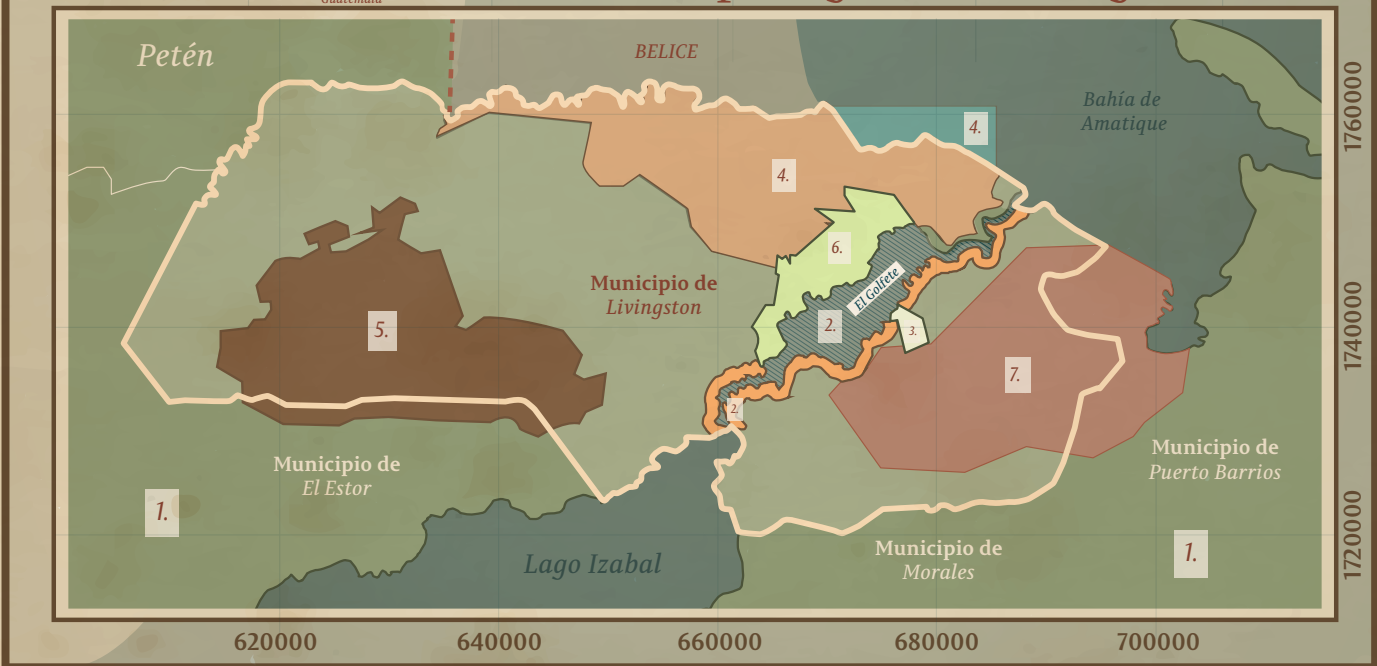
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Áreas naturales protegidas de Livingston



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

ACKNOWLEDGEMENTS TO FLAAR MESOAMÉRICA

Flor de María Setina is the office manager, overseeing all the diverse projects around the world. We also utilize the inkjet prints to produce educational banners to donate to schools.

Vivian Hurtado is the actual project manager for FLAAR's divisions: Flora & Fauna and MayanToons. She is also environmental engineer and passionate researcher

Victor Mendoza environmental engineer, is in charge of the photographic database of FLAAR Mesoamerica and its taxonomic identification. He also supports as a research assistant.

Sergio Jerez He is involved with plant identification, bibliographic research and map design for the trails explored on each expedition.

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

Senaida Ba has been our photography assistant for several years. Now, she puts together PowerPoint presentations for students and teachers to learn about several subjects like Flora, Fauna and Mayan Iconography.

Jaqueline González designer who puts together the text and photographs to create the actual report.

Roxana Leal major in Communication who manages all our social media and digital community. She's sometimes part of our fieldwork trips, since she has a special interest for adventure and Guatemala's diverse nature.

María Alejandra Gutiérrez is an experienced photographer who now prepares all the Photography Catalogs for the project we're currently working on the RBM. She also contributed to the coordination of several trips we made during our Livingston, Izabal research project.

David Arrivillaga is an experienced photographer 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.

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.

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.

Paula García is part of our MayanToons Animation team. Her job brings our favorite jungle, wetland and savanna characters to life.

María 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.

Byron Pacay handles GPS mapping of where we hike or go in the lancha (boat) each field trip day. He also lists where we stop to take photos and what each one of us is photographing and then has that tabulation ready each night.

Edwin Solares environmental engineering. 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 job includes organizing and tabulating data on useful and edible flora, which is listed in FLAAR's bibliography and many other references, in order to keep a complete list of plant species that are useful, along with updated taxonomical information.

Diana Sandoval her work consists of the recompilation of scientific information, which later is transformed into the FLAAR reports that are published on our websites.

María José Toralla she gathers information and bibliographies that are added to our Flora & Fauna electronic library and also make part of the information found in research, reports and websites.

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.

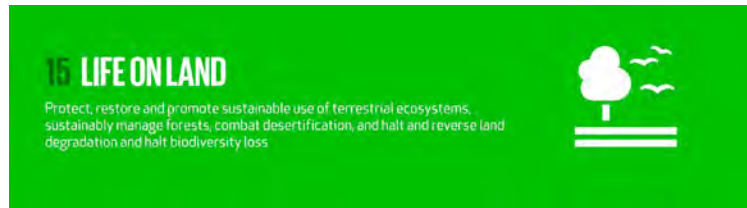
Niza Franco is part of our MayanToons Animation team. Her job brings our favorite jungle, wetland and savanna characters to life.

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

Isabel Rodríguez Paiz is in charge of the fundraising. She is experienced in networking, social media, and organizing meetings to experience what FLAAR does out in the remote rain forest ecosystems

Edible Plants of Municipio de Livingston from

Swamps, Marshes, and Seasonally Inundated Flatlands of Izabal



The current Alcalde of Livingston, Mr. Daniel Pinto, together with his team of International Cooperation division, Mr. Edwin Mármol, have 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. From this agenda, FLAAR Mesoamerica will collaborate to achieve Sustainable Development Goal (SDG) number 15 "Life on Land".

Throughout this cooperation project, different materials have been prepared, like this Photo Essay, that helps to collect information on species, different ecosystems: terrestrial, wetlands and fresh water biodiversity. This information would also be useful as part of a strategy to protect threatened species and prevent their extinction. The municipality's goals include to promote the sustainable use, conservation and research of the species of flora and fauna of the terrestrial, wetlands and aquatic shore and coastal ecosystems of the Guatemalan Caribbean. Learn more about this project and the SDG indicators at: <https://flaar-mesoamerica.org/rain-forests-rivers-lakes-bays-ocean-caves-canyons-livingston-the-caribbean-biodiversity-wonderland-of-guatemala/>

SERIES OF MUNICIPIO OF LIVINGSTON



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
www.maya-ethnozoology.org
www.maya-archaeology.org
www.digital-photography.org
www.FLAAR-Mesoamerica.org

This report may be cited with this information:

Hellmuth, N. (2021) Edible Plants of Wetlands, Yellow Nutsedge, *Cyperus esculentus*. Swamps and Marshes Of Livingston, Izabal, Guatemala: FLAAR Mesoamerica.

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FLAAR (in USA) and FLAAR Mesoamerica (in Guatemala) are both non-profit research and educational institutes, so there is no fee. And you do not need to write and ask permission; but we do appreciate when you include a link back to one of our sites. Any school, college, university, botanical garden, etc. can post this PDF on their school or university or institute website for their students to download at no cost. And you do not need to write and ask permission; but we do appreciate it when you include a link back to one of our web sites.

Any website in or related to the Municipio of Livingston, is also welcome to post this PDF on their web site (no fee). This permission includes travel agencies, hotels, guide services, etc. And you do not need to write and ask permission; but we do appreciate it when you include a link back to one of our web sites. CECON-USAC, CONAP, FUNDAECO, Plantemos, AIESEC, 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. USAC, UVG, URL, Universidad Rural, INTECAP and other Guatemalan universities, and high schools, and schools, are welcome to post our reports, at no cost.

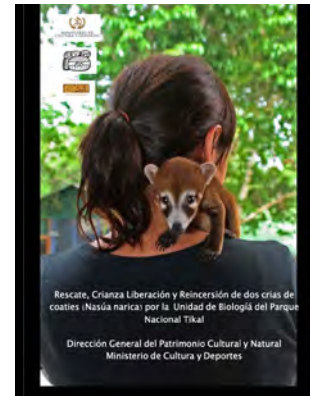
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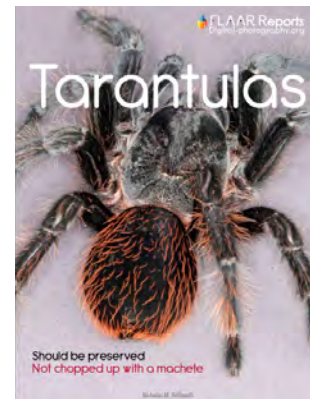
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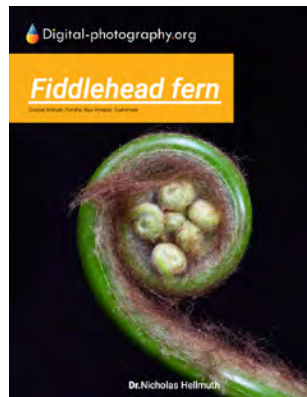
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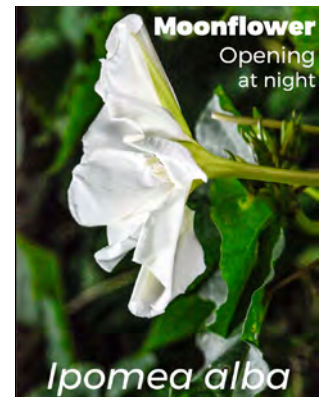
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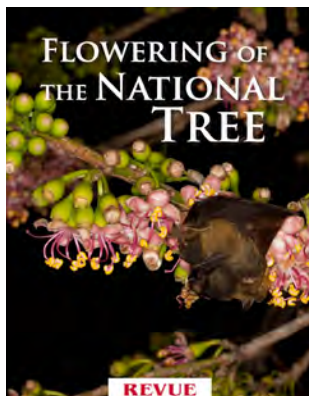
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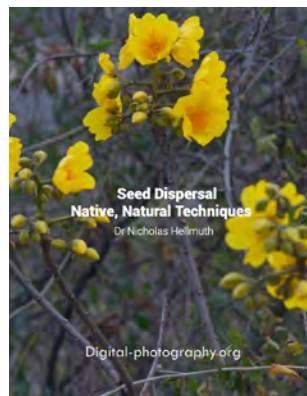
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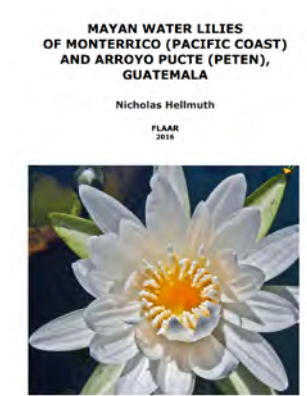
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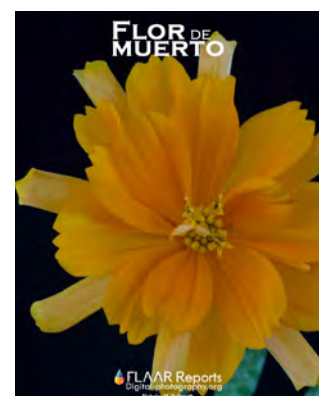
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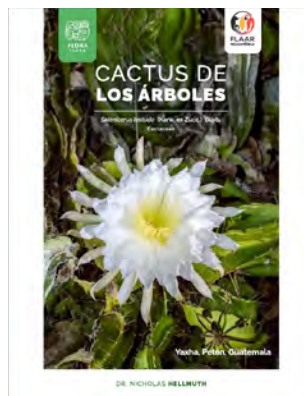
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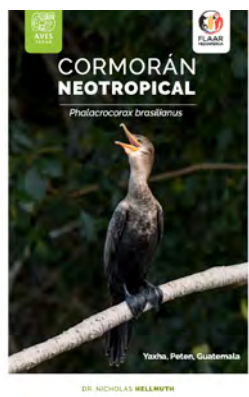
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