



WETLANDS #20

EDIBLE PLANTS OF WETLANDS

ZAPOTE NEGRO

Diospyros nigra

Municipio de Livingston,
Izabal, Guatemala

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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





Photo by: Guillermo Cuz, FLAAR Mesoamerica, Aug. 2021.
Aldea San Juan, Livingston, Izabal.

Camera: Google Pixel 3XL.

MY PERSONAL EXPERIENCE WITH *DIOSPYROS NIGRA* BY NICHOLAS HELLMUTH

For the recent two decades I have been dedicated to finding every plant that is edible and native to Guatemala and adjacent parts of Mesoamerica. My goal is to learn what plants did the Classic Maya have available to eat thousands of years ago (in addition to maize, beans, squash; in addition to root crops and ramon. There are many different trees whose fruits are named zapote. We study them one-by-one. The zapote that we had not noticed in previous years was “black zapote.” So, since we had an 18-month project of flora-fauna-ecosystem research in the eastern half of the Municipio de Livingston, we were finally able to find *Diospyros nigra* trees in various locations in this Caribbean part of Guatemala.

I call this “chocolate pudding fruit” because that is its name on the Internet. Just Google chocolate pudding fruit and you will get endless results.



Photo by: Guillermo Cuz, FLAAR Mesoamerica, Aug. 2021. Aldea San Juan, Livingston, Izabal.

Camera: Google Pixel 3XL.

FULL BOTANICAL NAME

Diospyros nigra (J.F.Gmel.) Perr. & Perr. is the accepted name, corresponding to the Ebenaceae family.

HERE ARE SYNONYMS FOR *DIOSPYROS NIGRA*

According to The Plant List data base *Diospyros nigra* has these synonyms:

Diospyros digyna Jacq.

Diospyros edulis Lodd. ex Sweet

Diospyros nigra Blanco

Diospyros obtusifolia Willd.

Diospyros obtusifolia Kunth

Diospyros pauciflora C.B.Rob.

Diospyros revoluta Poir.

Diospyros sapota Roxb.

Diospyros sapotanigera DC.

Diospyros tliltzapotl Sessé & Moc.

Sapota nigra J.F.Gmel.

As we will see later, *Diospyros nigra* is NOT listed for Mexico whatsoever. *Diospyros nigra* is NOT listed for Belize; nor are any of its synonyms. Since Izabal is adjacent to the southern border with Belize, surely any mangrove in Izabal should also be in nearby Belize.

ThePlantList (now superseded but I still prefer the old version) states that *Diospyros digyna* Jacq. is a synonym of *Diospyros nigra* (J.F. Gmel.) Perrier. So, the list of Vascular Plants of Belize does indeed have *Diospyros nigra* growing on its coastal mangrove swamps but under the old name *D. digyna*.

Now we have to find out why neither of these names is in Villasenor's 2016 report for Mexico.

Diospyros nigra (J.F. Gmel.) Perrier. ZILCH in Neotropical Flora Database

Edible Plants of Municipio de Livingston from

Swamps, Marshes, and Seasonally Inundated Flatlands of Izabal

Belize (Balick, Nee and Atha 2000: 79)	Mexico (Villasenor 2016)	Neotropical Plant Portal (Neotropical Flora)	ThePlantList.org
<i>Diospyros bumelioides</i> Standl.	<i>Diospyros bumelioides</i> Standl. CAM, CHIS, QROO, TAB, YUC		An accepted name
<i>Diospyros digyna</i> Jacq. FOOD, MED, POIS		Veracruz, Costa Rica, South America, Guatemala: Izabal, and PETEN!	<i>Diospyros nigra</i> (J.F. Gmel.) Perrier.
	<i>Diospyros ebenaster</i> Retz CHIS, GRO, HGO, JAL, MEX, MICH, MOR, OAX, QRO, TAB, VER, YUC		<i>Diospyros ebenaster</i> Retz. is a synonym of <i>Diospyros ebenum</i> J.Koenig ex Retz.
<i>Diospyros salicifolia</i> Willd. Loc Use: FUEL	<i>Diospyros salicifolia</i> Humb. & Bonpl. ex Willd. CAM, CHIS, COL, GRO, JAL, MEX, MICH, MOR, NAY, OAX, QROO, TAB, VER, YUC		An accepted name
	<i>Diospyros tetrasperma</i> Sw. CAM, CHIS, QROO, YUC		An accepted name

James Nations (2006: 64) lists *Diospyros ebenaster* as wild black persimmon, zapote negro, for the Lacandon forests of Chiapas. We would suggest further research on whether this means that more than one species is called zapote negro, or it is actually *Diospyros nigra*. A decade later Suzanne Cook lists *Diospyros digyna* for her research area of the Selva Lacandona of Chiapas (2016: 265). Today in 2022 all those are considered *Diospyros nigra*.

LOCAL NAMES FOR *DIOSPYROS NIGRA*

The local name in Livingston for this species is Zapote negro or Tortugo, but it is also widely known as Zapote, Zapote prieto, Totocuitlatzapotl (Mexico), Guayabota, Zapote de mico, Ébano, Matazano de mico and Persimón.

[Learn more on native fruits of Guatemala here](#)

[Learn more on *Diospyrus nigra* here](#)

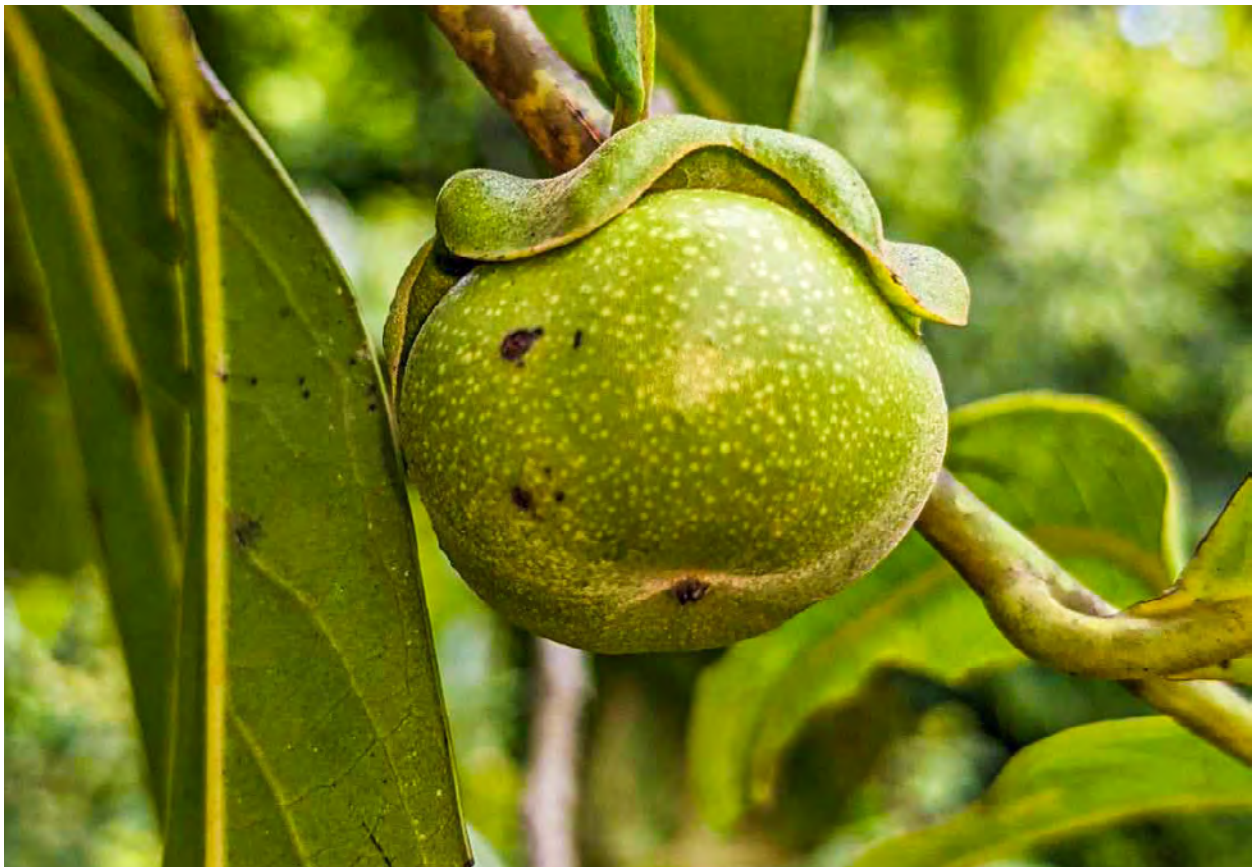


Photo by: Guillermo Cuz, FLAAR Mesoamerica, Aug. 2021. Aldea San Juan, Livingston, Izabal.
Camera: Google Pixel 3XL.

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

There is no other plant with exactly the name “Zapote negro”, but the term Zapote is associated with variety of species, such as *Pouteria sapota* (Zapote mamey), *Casimiroa edulis* (Zapote blanco), *Manicaria zapota* (Chicozapote), *Pouteria campechiana* (Zapote Amarillo), *Pouteria viridis* (Zapote verde). So the next time you hear or read the name “Zapote” it is important to know what “type” of Zapote is actually referring to.

MAYAN NAMES FOR *DIOSPYROS NIGRA*

In Yucatán is known as “Taúch” and in Maya K'iché its known as “Muc”.

[Learn more on *Diospyros anisandra* here](#)

Since there are dozens of different Mayan languages, it helps to look one-by-one. We show here an example for the Lacandon Maya (a language descended from Yucatec Maya):

'uuch (äh) chocolat e pudding fruit. Ebenaceae *Diospyros digyna* Jacq. , syn. *Diospyros ebenaster* Retz .

This is a black persimmon, native to Mexico. It is approximately the size of a medium tomato. At maturity, the pulp turns black, while the skin remains green. It matures in November. Cultivated. Loc: kolil nah, kol 'house garden, milpa'; Use: hanal 'food'; Part: wich 'fruit'; Prep: che'che 'raw'. Thes: che' (Fig. 5.210a, b). [Note: uuch. zapote negro (Bruce 1975); uch'. *Diospyros digyna* (Nations and Nigh 1980); xta'-'uch, x ta'-lùuch [Yuc.]. *Diospyros digyna* (Bricker et al. 1998).] [Source: AM; BM; CKD] [\sd2 food]

(Cook 2016: 265).

Ya', the yucatecan sapote

The Mayan word ya', which appears in the East, is translated in the five versions analyzed as "zapote", which, although it is not wrong, lends itself to an imprecision. In Mesoamerican Spanish, the word zapote subsumes various fruits, a product of the fact that, in the Nahuatl binary classification system of fruits and vegetables, tzápotl could include various fruits. Francisco Hernández, the Toledo protomedician who carried out his research in New Spain between 1571 and 1576, noted in his monumental work: "Mexicans, among whom the language of this New Spain flourishes in all its property and elegance, use to call with a certain universal denomination, tzapotl, to all fruits with a sweet flavor, as well as xocotl to all those with an acid flavor".

Many fruits that today we call "zapotes" are sapotaceae, such as tezontzápotl (*Pouteria mammosa*) and tzicotzápotl (*Manilkara zapota*), although there may be fruits from other orders and families such as tliizápotl (*Diospyros digyna*). Currently the word zapote designates in Chiapas and Guatemala *Pouteria mammosa*, which is known in the rest of Mexico and the Caribbean as mamey, a word of Arawako origin; Likewise, the word zapote is used in the Yucatan peninsula to name *Manilkara zapota*, which in the rest of the country we call "chicozapote". In the taxonomy of the peninsular Mayan language, there is a clear difference between ja'as (*Pouteria mammosa*), tauch (*Diospyros digyna*) and ya' (*Manilkara zapota*), so the translation made by the five versions, although correct, is ambiguous due to the characteristics of the word zapote, which designates around a dozen different fruits. The Calepino de Motul contains the following entry that unequivocally shows the relationship between the Mayan word ya' and the Nahuatl word tzicotzápotl: "Ya, niesperos [nísperos] of this land that in the Mexican language are called xico capolles [xicoçapotes]". Therefore, it would be preferable to use the term chicozapote to translate ya' and leave no doubt as to which fruit the text refers to, which, in fact, is more specific, since in Mayan taxonomy there are two types of chicozapotes: white (sak ya') and red (chak ya'); the latter is the one that relates to the East.

(Vassallo 2016).

If you are studying Maya use of plants, it always helps to look at *The Forest of the Lacandon Maya, An Ethnobotanical Guide*. I first learned about this area of Chiapas in 1963 when the INAH team working at Bonampak kindly accepted my offer to assist them to carry supplies from the dirt landing field in a remote Lacandon settlement and hike many kilometers through the Lacandon forest to the Maya ruins of Bonampak. I then stayed a week to help the INAH team set up their camp and research equipment.

HABIT FOR *DIOSPYROS NIGRA*

Tree, about 8-35 m high (Davidse, et al, 1995).

[Learn more on *Diospyros nigra* here](#)

HABITAT FOR *DIOSPYROS NIGRA*

This tree is native from Mesoamerica. In Guatemala has been reported in Izabal and the lowlands of Huehuetenango. It habits dry or humid mixed forests, riparian forests and montane forests; it grows at altitudes from 0 to 100 mamsl (meters above mean sea level)

(Standley y Williams, 1967).

[Learn more on *Diospyros nigra* here](#)

WHAT OTHER TREES OR PLANTS ARE OFTEN FOUND IN THE SAME HABITAT?

According to the “Plan Maestro Cerro San Gil” these are the trees that are often found in the same habitat as *Diospyros nigra*:

Edible Plants of Municipio de Livingston from

Swamps, Marshes, and Seasonally Inundated Flatlands of Izabal

Chelonanthus alatus Tabaquillo

Godmania aesculifolia Palo Blanco

Tabebuia guayacan Guayacán

Alseis hondurensis Zapote de Montaña

Clethra macrophylla Nance de Cerro

Parathesis cubana Ixpanol

Diospyros nicaraguensis Jaboncillo

Buddleja americana Salva Santa

WHAT OTHER TREES OR PLANTS ARE OFTEN FOUND IN THE SAME HABITAT?

According to the “Plan Maestro Cerro San Gil” this are the trees of plants that are often found in the same habitat as *Diospyros nigra*:

Clethra macrophylla Nance de Cerro

Parathesis cubana Ixpanol

Diospyros nicaraguensis Jaboncillo

Buddleja americana Salva Santa

Chelonanthus alatus Tabaquillo

Godmania aesculifolia Palo Blanco

Tabebuia guayacan Guayacán

Alseis hondurensis Zapote de Montaña

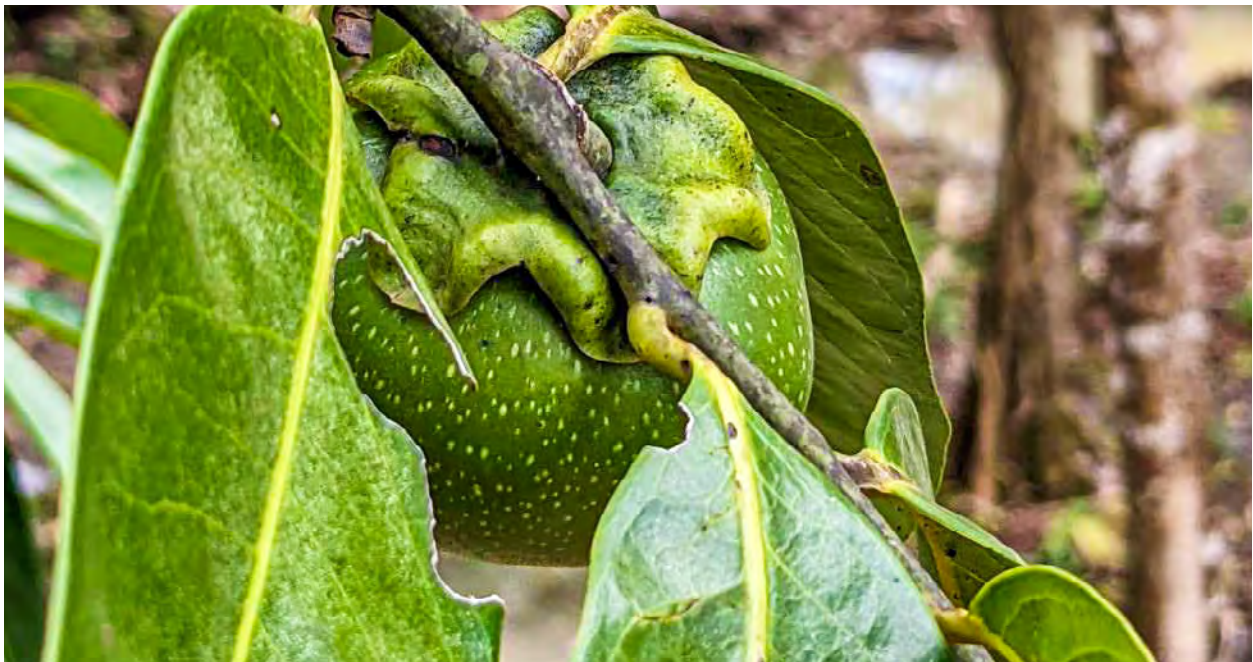


Photo by: Guillermo Cuz, FLAAR Mesoamerica, Aug. 2021. Aldea San Juan, Livingston, Izabal.

Camera: Google Pixel 3XL.

BOTANICAL DESCRIPTION OF *DIOSPYROS NIGRA* IN STANDLEY AND CO-AUTHORS CHICAGO BOTANICAL MONOGRAPHS

Diospyros digyna Jacq. Hort. Schoenbr. 3: 35, t. 313. 1798; Howard, Journ. Am. Arb. 42: 434. 1961. *D. obtusifolius* Humb. & Bonpl. ex Willd. Sp. Pl. ed. 4, 4: 1112. 1806; HBK. Nov. Gen. & Sp. 3: 253, t. 247. 1819. *D. ebenaster* of authors. Zapote negro; matazano de mico.

Dry or wet mixed forest usually at or little above sea level; Izabal; said to grow in the lowlands of Huehuetenango, and to be planted occasionally in other regions but the tree is not cultivated commonly in Guatemala. Mexico; British Honduras; Nicaragua; Costa Rica; West Indies; naturalized in the Old World tropics and cultivated there.

A medium sized or sometimes rather large tree, as much as 25 meters high with a trunk 45 cm. in diameter; leaves on short, stout petioles, subcoriaceous, lustrous, mostly oblong or elliptic-oblong, sometimes as much as 30 cm. long, persistent, somewhat narrowed to the obtuse or subacute apex, obtuse or acute at the base, glabrous; flowers polygamous, whitish, fragrant, in small, sessile or short-pedunculate few-flowered cymes, almost 1 cm. long, the corolla sericeous outside, urceolate, the lobes much shorter than the tube, rounded; fruiting calyx about 3.5 cm. broad, usually 4-lobate; fruit globose or depressed-globose, 4-7 cm. broad, olive-green or yellowish green, the flesh when fully ripe black; seeds about 1.5-2 cm. long, brown, somewhat compressed, smooth.

Called "zapote de mico" in El Salvador; "zapote prieto" (Mexico); "tauchi" (Tabasco); "tauch" (Maya); "ebano" (Yucatán). The immature fruits are intensely bitter and pucker the mouth. The ripe fruits are sweet and edible, but the black mushy flesh is repulsive in appearance, reminding one of dirty axle grease. In spite of this, the ripe fruit is much eaten in Mexico and some other countries, and is sometimes made into preserves, or fermented to produce a kind of brandy. The wood is reported to have the qualities of typical ebony.

(Standley and Williams, 1967: 247-248).



Photo by: Guillermo Cuz, FLAAR Mesoamerica, Aug. 2021.
Aldea San Juan, Livingston, Izabal.

Camera: Google Pixel 3XL.

DIOSPYROS NIGRA TREES IN BELIZE: STANDLEY AND RECORD

Zapote Negro, 317.

Diospyros ebenaster Retz. Zapote negro (Yucatán). Tauch (Yucatán, Maya). Honey Camp; Mexico to Costa Rica; cultivated in the East Indies. A large tree; fruit at maturity with an edible pulp of poor flavor, that is soft, black, and of most disgusting appearance.

DIOSPYROS NIGRA IN BELIZE (BALICK, NEE AND ATHA 2000)

Two decades ago, the name *Diospyros digyna* Jacq. was used. Today (2022) that is a synonym and the accepted name is *Diospyros nigra*.

Diospyros digyna Jacq. — Ref: FG 8: 247. 1967. — Reg Use:
FOOD, MED, POIS. — Habit: Tree. — Voucher: Contreras
7118; Gentle 1187; Lundell 502.

No presence of *Diospyros digyna* in Belize in this database; also zero results for *Diospyros nigra*: <https://serv.biokic.asu.edu/neotrop/plantae/collections/list.php>

Clearly Balick, Nee and Atha had access to other databases, in-person and on-line.

DIOSPYROS NIGRA MENTIONED IN TREES AND SHRUBS OF MEXICO, STANDLEY

Diospyros ebenaster Retz. Obs. Bot. 5: 31. 1789.

Diospyros obtusifolia Humb. & Bonpl.; Willd. Sp. Pl.4: 1112. 1805.

Diospyros tiltzapotl Sessé & Moc. Pl. Nov. Hisp. 179. 1887.

BOTANICAL DESCRIPTION OF THE *DIOSPYRAS NIGRA* BY STANDLEY FOR YUCATÁN

A medium-sized tree, flowering in April; leaves oblong to elliptic, sometimes 30 cm. long, leathery, obtuse or acutish, glabrous; fruit subglobose, green, 7.5 cm. or less in diameter, the pulp soft, black; seeds 4–10 cm large, compressed. The fruit is eaten; but it is not very good, and it is certainly most unattractive in appearance. A decoction of the leaves is used as an astringent and as a remedy for malaria. This species has been listed from Yucatanas "*Diospyros obtusifolia*". The wood is an ebony, being black and very hard.

(Standley, 1930, p. 377).

Four species of *Diospyros* are listed for the Calakmul area of Campeche (not far from Campeche-Peten border):

Diospyros anisandra S. F. Blake *Diospyros campechiana* Lundell

Diospyros bumelioides Standl. *Diospyros yucatanensis* Lundell

(Ochoa et al. 2018: 87-90).

CLOSE RELATIVE(S) OF *DIOSPYROS NIGRA*

Diospyros lotus L. Persimmon

Diospyros crassiflora Hiern. Gabon Ebony

Diospyros discolor Willd. Velvet Apple

Diospyros celebica Bakh. Black Ebony

(Duarte & Paull, 2015).

DIOSPYROS NIGRA IS MENTIONED IN TREES AND SHRUBS OF MEXICO, STANDLEY

Diospyros ebenaster Retz. Obs. Bot. 5: 31. 1789.

Diospyros obtusifolia Humb. & Bonpl.; Willd. Sp. Pl. 4: 1112. 1805.

Diospyros tiltzapotl Sessé & Moc. Pl. Nov. Hisp. 179. 1887.

Since *Diospyros ebenaster* is often confused with *Diospyros digyna*, and since *Diospyros digyna* is a synonym of accepted name *Diospyros nigra* it is essential also to learn about *Diospyros ebenaster*:

7. ***Diospyros ebenaster*** Retz. Obs. Bot. 5: 31. 1789. *Diospyros obtusifolia* Humb. & Bonpl.; Willd. Sp. Pl. 4: 1112. 1805. *Diospyros tiltzapotl* Sesse & Moc. Pl. Nov. H; sp. 179. 1887.

Cultivated in Mexico from Jalisco to Chiapas, Veracruz, and Yucatan, and apparently naturalized locally. Native of the East Indies, but widely cultivated in tropical America.

Large shrub or medium-sized tree; leaves oblong or elliptic, sometimes 30 cm. long, persistent, obtuse or acutish. glabrous; flowers polygamous; corolla yellowish white or greenish; fruit subglobose, shining, olive-green, the pulp dark and soft; seeds 4 to 10." Zapote prieto " (Jalisco, Chiapas, Michoacan, Guerrero, Morelos, Tabasco, Yucatan, Philippines); " tauch," " tauch ya" (Yucatan, Maya); "zapote negro" (Oaxaca); "biaqui" (Oaxaca, Zapotec, Reko); "tliltzapotl," "totocuitlatzapotl," "tlilzapotl" (Nahuatl); "guayabota" (Porto Rico).

This tree must have been introduced into Mexico at an early date, for it is mentioned by the older writers. Indeed, some writers have been inclined to consider it a native of Mexico, and Merrill states that it was carried from this country to the Philippines.

The tree is said to be the source of some of the East Indian ebony. The fruit is eaten, but is of poor quality. The green fruit is reported to have been used in the Philippines and West Indies for stupefying fish. In Mexico the ripe fruit is made into preserves, which are reported to be of excellent quality. Brandy also is said to have been made from the pulp. Urbina reports the Otomi names as " bom-rza " and " phonimurza."

The tree was described by Hernandez under the name "tlilzapotl" ("black zapote"). He states that it was used as a remedy for leprosy, ringworm, and itch, and also for killing fish.

(Standley 1924: 1128)

Note that even *Diospyros ebenaster* is sometimes also named black zapote.



Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Aug. 1, 2021. Aldea San Juan, Livingston, Izabal.

Camera: Nikon D810 Lens: Nikon 200mm AF-D Tele-Macro. Settings: 1/250 sec; f/11; ISO 200.

WHERE HAS *DIOSPYROS NIGRA* BEEN FOUND IN THE MUNICIPIO OF LIVINGSTON?

Not reported.

- Is *Diospyros nigra* listed for Biotopo Protegido Chocón Machacas, CECON/USAC?
Not Reported.
- Is *Diospyros nigra* listed for Tapón Creek Nature Reserve (including Taponcito Creek), FUNDAECO?
Not reported.
- Is *Diospyros nigra* listed for Buena Vista Tapón Creek Nature Reserve?
Not Reported.
- Is *Diospyros nigra* listed for Cerro San Gil (south side of Río Dulce)?
The *Diospyros nigra* is mentioned in the list of flora species (Ruiz et al., 2006).
- Is *Diospyros nigra* listed for El Refugio de Vida Silvestre Punta de Manabique?
Not Reported.
- Is *Diospyros nigra* listed for Ecoalbergue Lagunita Creek (Área de Usos Múltiples Río Sarstún)?
Not Reported.
- Is *Diospyros nigra* listed for Sarstoon-Temash National Park (northern side of Río Sarstún)?
Not Reported.
- Is *Diospyros nigra* listed for Bocas de Polochic?
Not Reported.
- Is *Diospyros nigra* from the Highlands or from the Lowlands (or both)?
Lowlands.



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Camera: Nikon D810 Lens: Nikon 200mm AF-D Tele-Macro. Settings: 1/250 sec; f/11; ISO 200.

WORLD RANGE FOR *DIOSPYRAS NIGRA*

Native to South America, occurring wild along both coasts of Mexico from Jalisco to Chiapas, Veracruz and Yucatán and in the forested lowlands of Central America. It is frequently cultivated throughout this range. It has been introduced and cultivated elsewhere around the tropics including the Caribbean, Southeast Asia and Australia (Lim, 2019).

DOES *DIOSPYROS NIGRA* ALSO GROW IN HOME GARDENS?

The tree has been cultivated in South Florida, in home gardens and small commercial orchards (Duarte & Paull, 2015).

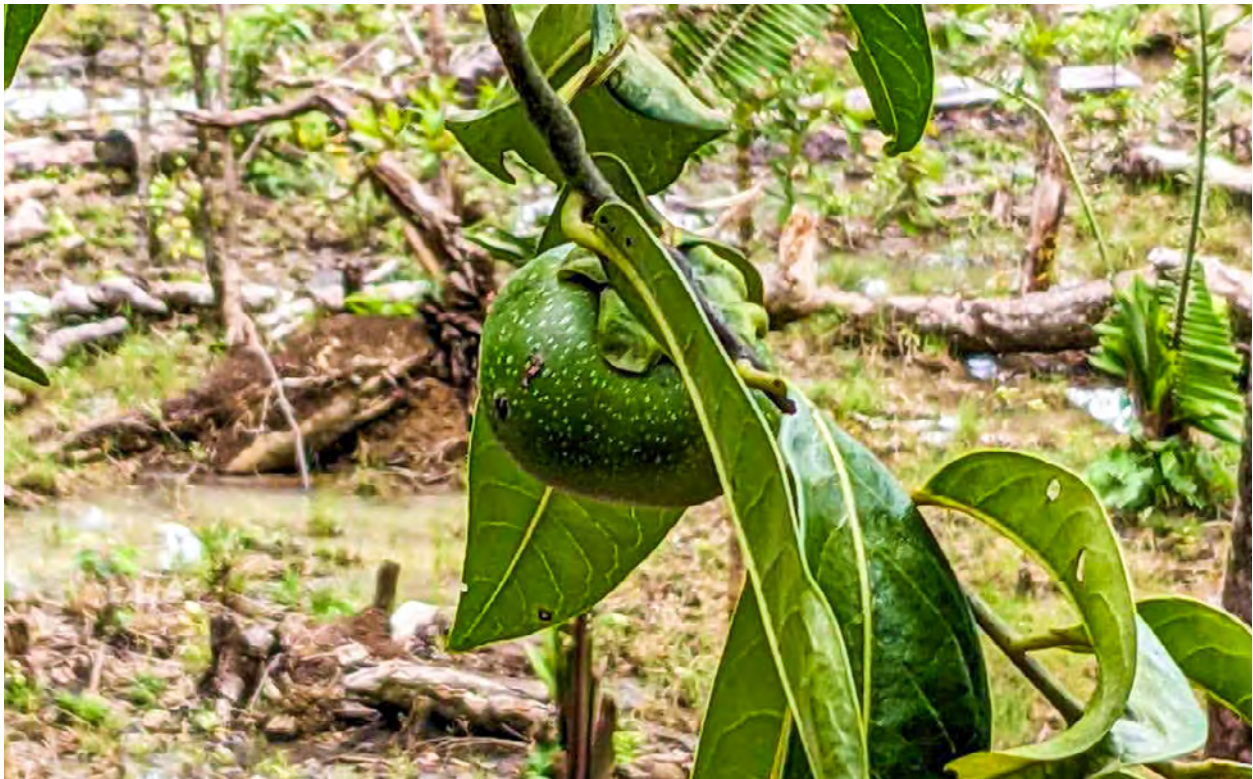


Photo by: Guillermo Cuz, FLAAR Mesoamerica, Aug. 2021. Aldea San Juan, Livingston, Izabal.

Camera: Google Pixel 3XL.

USES OF *DIOSPYRAS NIGRA*

This fruit is used mainly when it is ripe because it's during this state that its brownish-black pulp is soft. In their immature state they are very astringent. These fruits mainly contain carbohydrates, minerals, and an ascorbic acid content greater than in citric fruits. They can be eaten raw, or it is also possible to make marmalades, ice-cream, jams, and other desserts from the pulp. It has medicinal properties as a laxative and to treat hyperglycemia. It is also used as a home remedy as a laxative and to decrease sugar levels in diabetic patients. The timber is of great quality, with characteristics that make it similar to ebony timber. It is used in the manufacturing of golf clubs, sculptures, piano keys, luxury furniture, knife handles and brushes (Standley y Williams, 1967; Gutierrez, 2013).

IS THERE POTENTIAL MEDICINAL USAGE OF *DIOSPYRAS NIGRA* BY LOCAL PEOPLE?

Traditional medicinal uses of black zapote are few. The crushed bark and leaves have been applied as a blistering poultice in the Philippines. In Yucatán, the leaf decoction was employed as an astringent and was taken internally as a febrifuge. Various preparations were used against leprosy, ringworm and itching skin conditions (Lim, 2019, pp. 425–427).

ARE ANY PARTS OF *DIOSPYRAS NIGRA* EATEN BY MAMMALS?

The pulp is eaten fresh when fully ripe and soft, although it does not have as much flavor or aroma (Duarte & Paull, 2015). Thus, we assume it is also eaten by mammals.

WHAT ARE THE PRIMARY POLLINATORS OF *DIOSPYRAS NIGRA* FLOWERS?

Flowers are pollinated by insects. Some varieties may be self-incompatible and therefore require cross pollination with another variety or seedling that produces male or bisexual flowers to produce fruit (Crane & Balerdi, 2005).



Photo by: Guillermo Cuz, FLAAR Mesoamerica, Aug. 2021.
Aldea San Juan, Livingston, Izabal.

Camera: Google Pixel 3XL.

CONCLUDING DISCUSSION AND SUMMARY ON *DIOSPYRAS NIGRA* TREES

Diospyras nigra is a native plant of Mesoamerica that has been reported in Guatemala, in Izabal and the lowlands of Huehuetenango, according to Standley and co-authors. Despite this, the species is not listed in any plant inventory for the natural reserves in Livingston, but during our project we were able to document this tree, contributing to the register of the species in the area.

The main use of zapote negro is edible, its fruit can be eaten raw and has the potential to do more products with the fruit like jams and deserts. Although it has potential medicine usage as a laxative, to decrease sugar levels in diabetic patients, astringent, against leprosy, ringworm and itching skin conditions, the usage has been more as a home remedy and not in a pharmaceutical way. The timber is of great quality and is used in the manufacturing of golf clubs, sculptures, piano keys, luxury furniture, knife handles and brushes, so it provides a good opportunity to exploit by locals.

The objective of this report is to evidence the potential uses of the plants found in the Municipio de Livingston during our project and share high quality photographs of these species, provide a sample of about 10% of what has been written about zapote negro and to remind us that more ethnobotanical and biological field work needs to be accomplished in other areas of the Maya Lowlands.

We also hope the present FLAAR Report inspires botanists, students, and local people to document and study this plant, and to preserve the natural habitats where it grows.

REFERENCES CITED AND SUGGESTED READING *ON DIOSPYRAS NIGRA*

Most helpful mention of this plant (because this book lists the most uses):

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

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

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

Not available as a download.

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

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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.

2014 Maya Ethnobotany, Complete Inventory, Fruits, nuts, root crops, grains, construction materials, utilitarian uses, sacred plants, sacred flowers 13th edition. FLAAR Reports, FLAAR (USA) and FLAAR Mesoamerica (Guatemala). 111 pages.

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2003 Rapid Ecological Assessment Sarstoon Temash National Park Toledo District, Belize. Volume II: Appendices (Species lists and raw data). Temash Institute for Indigenous Management (SATIIM). 92 pages.

OCHOA-Gaona, Susana, RUÍZ González, Hugo, ÁLVAREZ Montejó, Demetrio, CHAN Coba, Gabriel and Bernardus H. J. DE JONG

2018 Árboles de Calakmul. ECCOSUR, Chiapas. 245 pages.

It is amazing that there is no such book for Parque Nacional Tikal, nor El Mirador. Even though it includes only half the estimated number of "trees", it has more tree species than Schulze and Whitacre for Tikal (they estimated about 200 but list only about 156 (their lists of species and list by plant family are not identical).

The entire book is a totally free download. However, you can't copy and paste so is difficult to add to your discussion.

In the future it would be helpful to have a photographer with high-resolution equipment available, and a book producer that can put these photos at a resolution that allows you to see the details. The photos of the overall tree have almost no visible detail. Nonetheless, the authors all have botanical experience, and this book is a good start. A second edition would be helpful. It would also help to have more than one page per photo.

Louteridium is too often considered a shrub, so it would not be expected in monographs on "TREES".

http://aleph.ecosur.mx:8991/exlibris/aleph/a22_1/apache_media/74R92G-MRSJSEPFDEE5NJY4SJI2I8AK.pdf

PARKER, Tracey

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

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

PEÑA-Chocarro, María and Sandra KNAPP

2011 Árboles del Mundo Maya. Natural History Museum Publications. 263 pages.

Helpful book; contributing authors are experienced botanists. They cover 220 species of trees, more than virtually all other "Books on Trees of the Maya". They even include tasiste (which is missing from all other books on "Trees of the Maya", except for the recent book on Árboles de Calakmul).

But if all this effort is going into a book, it would be helpful if there were more photos, larger photos, and not so much blank space at the bottom of each page. Plus, it would help if the text could include personal first-hand experience with these trees out in the Mundo Maya. But even as is, it is a helpful book.

If you are doing field work you need this, plus Árboles de Calakmul, plus Árboles tropicales de México. Parker's book you need back in your office, since out in the field it's not much help due to lack of photographs. Back in your office the books by Regina Aguirre de Riojas are also helpful.

PENNINGTON, Terence D. and José SARUKHAN

2005 Árboles tropicales de México. Manual para la identificación de las principales especies. 3rd edition. UNAM, Fondo de Cultura Económica. 523 pages.

This book is a serious botanical monograph. 1968 was the first edition (I still have this), 1998 was second edition. The 3rd edition is a "must have" book. Each tree has an excellent line drawing of leaves and often flowers and fruits (though to understand flowers you need them in photographs, in full color). Each tree has a map showing where they are found in México (such maps are lacking in most books on Trees of Guatemala or plants of Belize). But trying to fit a description of a tree on one single page means that a lot of potential information on flowering time is not present. Plus, this is definitely not a book on ethnobotany: for that you need Suzanne Cook.

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.

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1922 Trees and Shrubs of Mexico. Contributions from the United States National Herbarium, Volume 23, Part 2. 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.

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1936 The forests and flora of British Honduras. Isha Books.

STANDLEY, C. P., and CARPENTER.

1961 Trees and shrubs of Mexico (Vol. 2). Alpha Edition.

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). Therefore, 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, 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 *DIOSPYROS NIGRA*

<https://catalogofloravalleaburra.eia.edu.co/species/273>

Photos and general information.

<http://www.conafor.gob.mx:8080/documentos/docs/13/917Diospyros%20digyna.pdf>

Complete information.

<https://www.elmundoforestal.com/portfolio/zapote-negro-o-pudin-de-chocolate/>

General information and related species.

<https://enciclovida.mx/especies/163962-diospyros-nigra>

Photos, general information and distribution map.

<https://www.growables.org/information/TropicalFruit/BlackSapote.htm>

Complete information and photos.

https://revivemx.org/Recursos/Fichas_propagacion/FichaPropagacion_F2_Diospyros_nigra.pdf

Data sheet.

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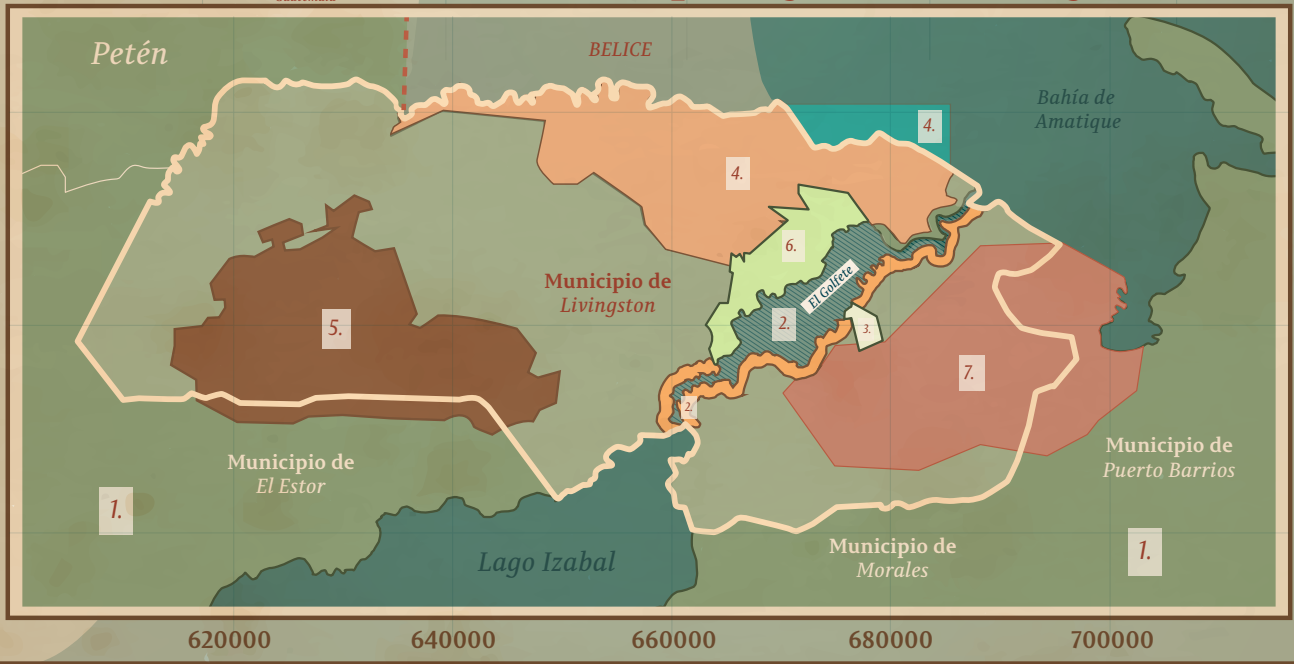
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Áreas naturales protegidas de Livingston



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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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Vivian Hurtado is the current project manager of the FLAAR divisions: Flora & Fauna and MayanToons. She is also an environmental engineer and a passionate researcher.

Victor Mendoza environmental engineer in charge of the photographic database and its taxonomic identification. He also helps with the coordination of research activities.

Sergio Jerez agronomy engineering student involved in the identification of plants and support in research topics.

Belén Chacón biology student who organizes, tabulates and updates our ethnobotanical list.

Diana Sandoval agricultural engineer who compiles scientific information that is added to our flora and fauna reports.

María José Toralla biology student collects information and bibliographic references to feed our electronic library of flora and fauna and support research for reports and websites.

Samuel Herrera is in charge of processing maps of our field trips and helping with the identification and investigation of species.

Pedro Pablo Marroquín is part of the editing team, review and add information to our photographic reports

Alejandra Valenzuela is a biology student and part of the photographic reports editing team. She also supports the realization and analysis of web statistics.

Maria José Rabanales is part of the photographic reports editing team

Senaida Ba has been our photography assistant for several years. Now helps prepare PowerPoint presentations on the topics of Flora, Fauna and Mayan Iconography.

Byron Pacay is our assistant during the field trips.

Norma Cho is our assistant during the field trips.

Roxana Leal degree in communication. Manage all our social networks and digital community.

Isabel Rodriguez Paiz is in charge of fundraising and partnership development.

Edwin Solares is a photographer and videographer during our expeditions. Later, he edits this content to be used in our different materials.

Pedro Pablo Ranero is responsible for editing videos of flora and fauna to create content on our sites.

Andrea de la Paz graphic designer who helps prepare the graphic line of our publications. She is our editorial art director.

Jaqueline González graphic designer who combines text layout and photo editing to create our reports.

Heidy Galindo graphic designer who combines text layout and photo editing to create our reports.

Alexander Gudiel graphic designer who combines text layout and photo editing to create our reports.

Cristina Ríos graphic designer who combines text layout and photo editing to create our reports.

David Arrivillaga is an experienced photographer and graphic designer. Sometimes he is a photographer during our expeditions, but he also designs our flora and fauna reports.

María Alejandra Gutiérrez is an experienced photographer who is now in charge of the preparation of photographic catalogs. She was also coordinator of the field trips for the research project in Livingston, Izabal.

Paulo Núñez is our webmaster. He is the person in charge of the maintenance and programming of the entire network of FLAAR websites.

Juan Carlos Hernández is part of the web team. Receive the material we produce to place on our sites.

María José García is part of the web team. Receive the material we produce to place on our sites.

Andrés Fernández is in charge of keeping our websites updated and more efficient for the user.

Valeria Áviles is a graphic designer and illustrator. She is in charge of coordinating the activities of MayanToons, as well as making illustrations for the different materials that we prepare.

Laura Morales is a digital content engineer He is in charge of directing the animation area of our MayanToons project.

Paula García is part of our MayanToons Animation team. His job is to bring our favorite characters to life.

Niza Franco is part of our MayanToons Animation team. His job is to bring our favorite characters to life.

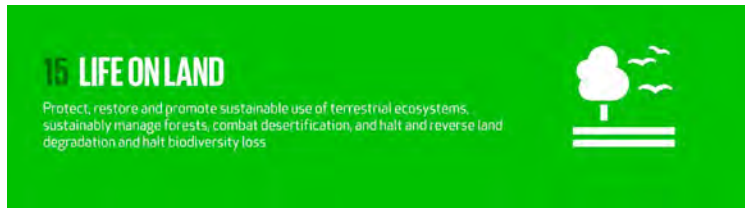
Isabel Trejo is a graphic designer and illustrator for MayanToons.

Josefina Sequén is an illustrator for MayanToons.

Rosa Sequén is an illustrator for MayanToons.

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
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www.FLAAR-Mesoamerica.org

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Hurtado, V., Marroquín, P. (2022) Edible Plants of Wetlands, Zapote Negro, *Diospyros nigra*. Livingston, Izabal, Guatemala: FLAAR Mesoamerica.

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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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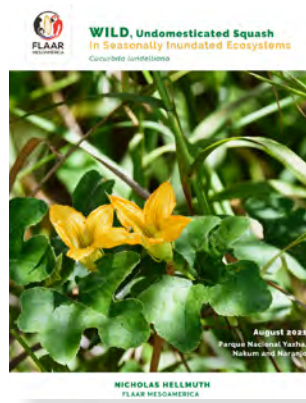
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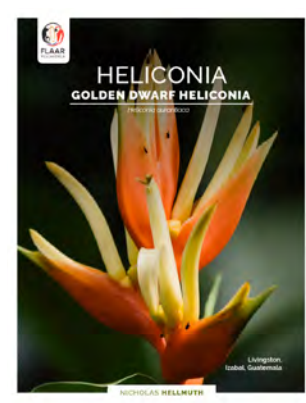
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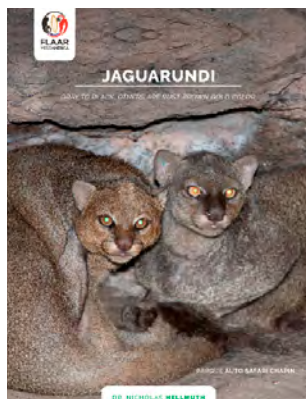
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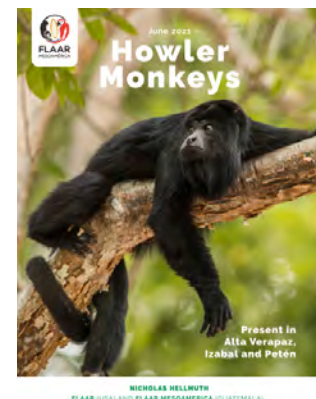
**Listado Actualizado de los
Mamíferos de Guatemala**
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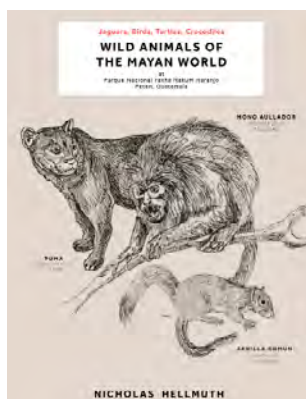
Jaguarundi
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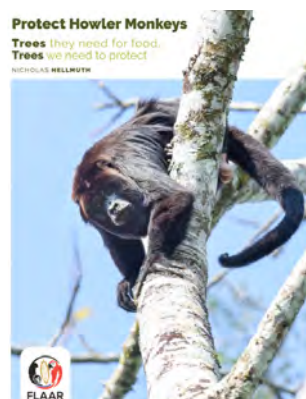
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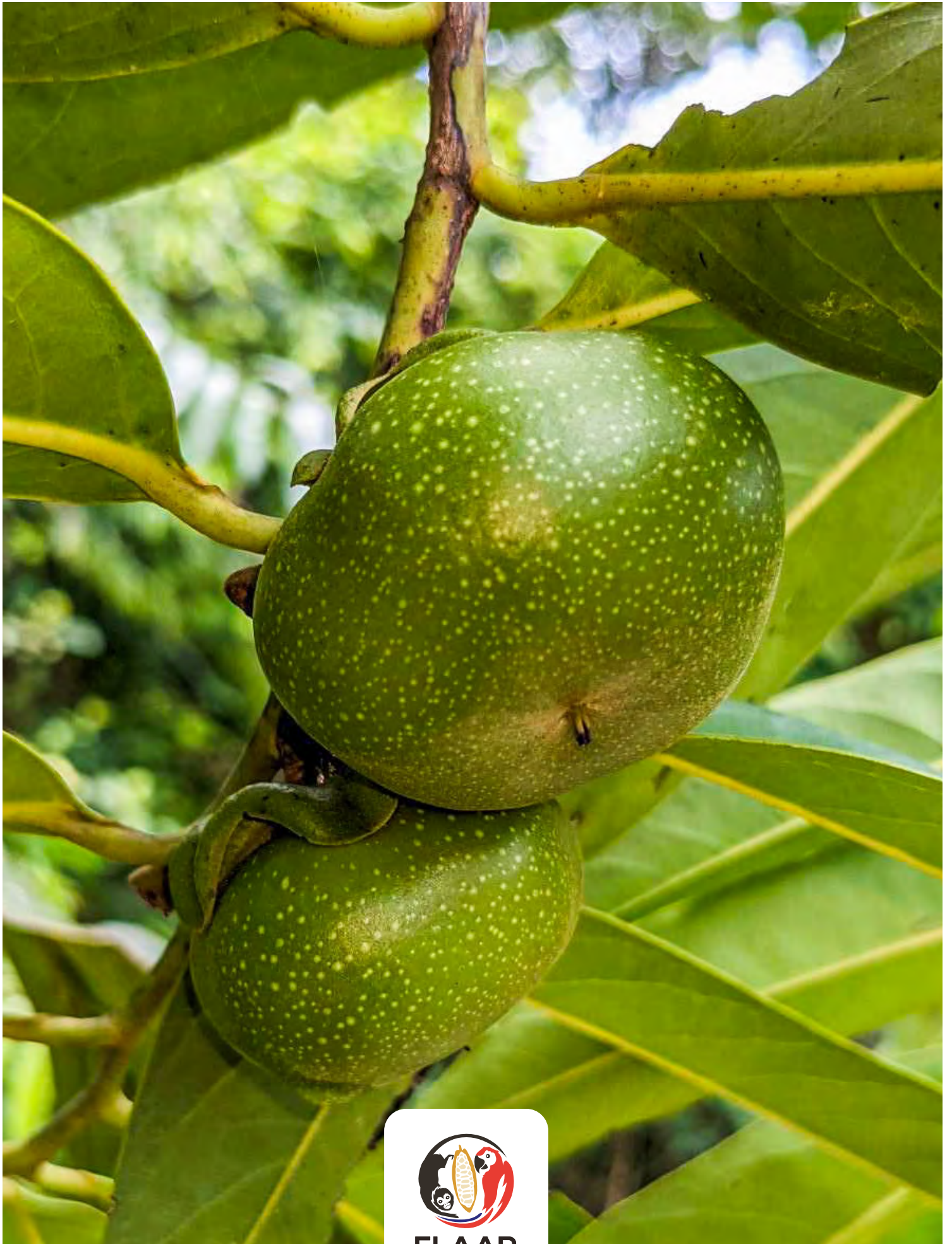


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