Yellow Dye Colorant
PNLT Savanna #10

Cephalanthus occidentalis

Seasonally Inundated Wetlands of the Southeastern portion of Parque Nacional Laguna del Tigre (PNLT)

Reserva de la Biosfera Maya (RBM)
Petén, Guatemala

Nicholas Hellmuth
June. 2022

FLAAR MESOAMÉRICA

FLAAR

INITIATION AND COORDINATION OF THE CONAP PROJECT OF COOPERATION FOR 2021–2025

- **Licda. Merle Fernández** - CONAP
- **Marla Mercedes Bolvito Jerónimo** Unidad de Cooperación Nacional e Internacional de la Secretaría Ejecutiva de CONAP
- **Licda. Ana Luisa De León N.** Directora de Educación para el Desarrollo Sostenible, CONAP
- **Lic. Apolinario Córdova** - CONAP Petén
  Ing. Jorge Mario Vázquez - CONAP Santa Elena, Petén

COOPERATION AND COORDINATION FOR FLORA, FAUNA, ECOLOGY RESEARCH SOUTHEAST AREA OF PNLT

- **Ing. Edvin Ramírez Villalobos,** Director Parque Nacional Laguna del Tigre
- **Julio Peña,** técnico de CONAP
- **Rony Chata Soza,** técnico de CONAP

HOSPITALITY BY CONAP TEAM AT PARK ENTRANCE, JUNE 1 - 6, 2022

- Filadelfio Cortez Santiago

FLORA AND FAUNA SCOUT

- Moisés Daniel Pérez Díaz, "Teco"

GUIDES FOR FAR EAST-SOUTHEAST AREA, MAY 31, 2022

- Elías Xol
- Luis Martínez

GUIDES AND EQUIPMENT PORTERS DURING JUNE RESEARCH IN PNLT

- Leonardo Bo
- Gonzalo Caal
- Franklin Pérez

DRIVER OF LIFTED 4WD, MAY 31, 2022

- Sabino Mayen Santos

HELPFUL COOK AT CONAP CAMP AREA, MAY 31, 2022

- Miriam Candelaria Xol

- **FRONT COVER PHOTOGRAPH**

  Photo by: Nicholas Hellmuth, FLAAR Mesoamerica. Jun. 5, 2022. Camera: iPhone 13 Pro Max.

Hotel Tikal Inn

We thank Roxana Ortiz for offering to provide lodging for our research team at the Tikal Inn for our field trips in October 2022 and January 2023. Since we are not receiving payments for our field work, our budget appreciates complimentary lodging. Every workday is exhausting because we are carrying and then using very heavy cameras, super-telephoto lenses, sturdy tripods, large gimbals or ball tripod heads. Thus it is crucial for my health to be able to rest and totally recuperate every night in order to be ready for the following day of botanical and zoological adventures in Parque Nacional Tikal. In order to post photographs on botanical and zoological websites, you can't do this if there is either no Internet or weak Internet. Thus it is very helpful that when we are provided rooms and meals, that functional Internet is available at the Hotel Tikal Inn.

Contact info:
- **Book by Phone: (502) 7861 2444 or (502) 7861 2445**
- **Book by email: Email: tikalinn@gmail.com**
- **Website: www.TikalInn.com**

CREDITS

AUTHOR
- Nicholas Hellmuth

COMPILATION OF BASIC DATA FROM EARLIER BOTANISTS
- Nicholas Hellmuth

PLANT IDENTIFICATION (GENUS SPECIES)
- Nicholas Hellmuth
- Victor Mendoza

BIBLIOGRAPHY TEAM
- María José Toralla

EDITORS
- Vivian Díaz
- Alejandra Valenzuela

PHOTOGRAPHERS
- Nicholas Hellmuth
- Edwin Solares

PHOTOGRAPHY ASSISTANT
- Norma Cho Cu

GPS MAPS DURING THE MARCH 2023 FIELD TRIP
- Byron Pacay

MANAGER OF DESIGN AND LAYOUT
- Andrea Sánchez Díaz

LAYOUT OF THIS ENGLISH EDITION
- Jaqueline González

CONTENTS

CONTENTS

Introduction to *Cephalanthus occidentalis* of Guatemala

Cephalanthus occidentalis is a deciduous shrub or tree commonly known as buttonbush. It particularly thrives in wetland ecosystems, like seasonally inundated lowlands, due to its high tolerance and adaptations to flooded soils. In official websites only a handful of registered collections can be found for Guatemala, all of them from the Departamento of Petén. However, there is plenty of published information on this species for bordering regions of Mexico. States like Campeche, Chiapas, Tabasco and Quintana Roo which border with Petén and share similar ecosystems, have updated research about this wetland biodiversity. This means that there is a need for updated research and collections of *C. occidentalis* found in Guatemala, specifically for Petén where we were able to find and photograph it. These trees certainly deserve more attention in Guatemala and adjacent countries.

My Personal Experience with *Cephalanthus occidentalis*

I have not noticed this "exploding golf ball" "virus shaped" flower structure before (in 50 years of hiking in the Maya Lowlands and Highlands). Our plant scout, Teco (Moisés Daniel Pérez Díaz) said also that he has not noticed this plant in his decades as park ranger at PNYNN nor his many years hiking into remote areas elsewhere in the Maya Lowlands of Guatemala that rarely do you see an individual flower.

Photo by: Edwin Solares, FLAAR Mesoamerica, Jun. 5, 2022.
Camera: Sony A1. Settings: 1/320; sec; f/13; ISO 1,250.

Full Botanical Name

Cephalanthus occidentalis L. is the accepted name.

Family name Rubiaceae.

Lim prefers to use the name *Nauclea orientalis* (L.) L. and to place it in the family Naucleaceae. His list of synonyms is endless 2013: 754). His description of *Nauclea orientalis* is primarily from Thailand to Australia. Zilch mention of Mesoamerica. His photos show the same spherical ball on which the flowers sit, but his description is not related to the plant from Mesoamerica. And, ThePlantList does not mention any of his names. Let's hope botanists can sort out this mish-mash.

Here are synonyms for *Cephalanthus occidentalis*

- *Cephalanthus acuminatus* Raf.
- *Cephalanthus angustifolius* Dippel
- *Cephalanthus berlandieri* Wernham
- *Cephalanthus hansenii* Wernham
- *Cephalanthus obtusifolius* Raf.
- *Cephalanthus occidentalis* var. *brachypodus* DC.
- *Cephalanthus occidentalis* subsp. *californicus* (Benth.) A.E.Murray
- *Cephalanthus occidentalis* var. *californicus* Benth.
- *Cephalanthus occidentalis* f. *lanceolatus* Fernald
- *Cephalanthus occidentalis* var. *macrophyllus* Raf.
- *Cephalanthus occidentalis* var. *obtusifolius* Raf.
- *Cephalanthus occidentalis* var. *occidentalis*
- *Cephalanthus occidentalis* f. *occidentalis*
- *Cephalanthus occidentalis* var. *pubescens* Raf.
- *Cephalanthus oppositifolius* Moench
- *Cephalanthus pubescens* Raf.

(Click here to read more)

Photo by: Nicholas Hellmuth, FLAAR Messoamerica. Jun, 5. 2022 Camera: iPhone 13 Pro Max.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica. Jun. 5, 2022.
Camera: iPhone 13 Pro Max.

Local names for *Cephalanthus occidentalis*

Buttonbush, button willow, honeyball, riverbush. Also named Rosa de San Juan, Guayabillo or Jasmín in some areas of Mexico like Chihuahua, Guerrero, Tabasco and Veracruz (González Elizondo et al. 2007: 13).

Habit for *Cephalanthus occidentalis*

Most references catalogue *C. occidentalis* as a deciduous shrub, but some references say that it can also be a tree. It all depends on having the right conditions like soil, rain and sunlight, but also factors like human intervention (chopping and burning of these forests) can prevent the plant to reach its full height.

Is *Cephalanthus occidentalis* a vine? Or a bush? Or a Tree?

Shrub or tree (Balick, Nee and Atha 2000: 141). In the Savanna #10 we found it as a shrub. Its size obviously depends on local soil, rain and sunlight; and for a savanna, they get incinerated every year or at least every three years so a plant can't always reach tree size before it is burned down.

According to North Carolina State University's web page, this plant can sometimes grow up to 20-25 feet (6-7 meters) and be classified as a tree, but it is more commonly found as a shrub of under 12 feet with a wide trunk. They also mention that *C. occidentalis* thrives in habitats like swamps or riverbanks and places with lots of direct sunlight. Such conditions make these ecosystems some of the few where it can reach its full size.

Photo by: Nicholas Hellmuth, FLAAR Messoamerica. Jun, 5. 2022 Camera: iPhone 13 Pro Max.

Parts of *Cephalanthus occidentalis'* flowers

I have not noticed this "exploding golf ball" "virus shaped" flower structure before in any other plant. In fact, those "golf ball" we see are inflorescences, a cluster of flowers that are arranged on a same stem. The flowers are actually tiny elongated white or brownish flowers that sit on a round fleshy receptacle at the end of the peduncle. These flowers may be small but each one of them has a corolla parted in four petals, enclosing four stamens with dark anthers and one pistil with a style and stigma which are slightly exserted. Flowers like these on *Cephalanthus occidentalis* are called "perfect flowers" because they have both masculine and feminine reproductive structures. In an inflorescence, the receptacle is the place on the stem where the flowers are attached which later secures the fruit. Since the receptacle has this spherical shape, this gives the inflorescence its peculiar "virus" or "golf ball" appearance. Plus, the tiny white flowers add the illusion that they are exploding from the inside of the ball.

- **Flower:** reproductive organ of a plant that bears stamens and/or pistils.
- **Inflorescence:** cluster of flowers arranged on a same peduncle.
- **Receptacle:** an enlarged or elongated end of a peduncle on which all or some of the flower parts grow.
- **Peduncle:** primary stalk that supports a flower cluster.
- **Corolla:** the part of a flower that consists of the petals and encloses the stamens and pistil.
- **Stamens:** part of the masculine reproductive structure that produces pollen, composed of an anther supported by a filament.
- **Anthers:** portion of the stamen that bears the pollen.
- **Pistil:** organ that includes the ovary, style, and stigma; also called gynoecium.
- **Style:** slender stalk that connects the stigma with an ovary.
- **Stigma:** the part of the pistil that receives the pollen.

The definitions provided in this section were written based on "The Illustrated Glossary of Botanical Terms" by Wihelm & Rericha (2017: 43). If you are interested in learning more about flower parts or botanical terms in general, this is a good reference to start with since it has images that can help understand the different parts it describes.

In what Ecosystem(s) can you find native *Cephalanthus occidentalis?*

C. occidentalis is a common shrub that grows along swamps, marshes and other riparian and wetland ecosystems that are inundated for several months each year. It also grows in grasslands and savannas (Snyder 2018: 3, 16). Lot (1991: 20) mentions *C. occidentalis* as a commonly found species in the coastal regions of the Gulf of Mexico. Riparian forests, savannas, and freshwater wetlands of the region appear to be ecosystems in which this species thrives. Wetlands and floodable lowlands are particularly ideal for this species since *C. occidentalis* is well adapted survive in flooded areas.

Cephalanthus occidentalis' adaptations to Flooding

Cephalanthus occidentalis seedlings are highly tolerant to flooding, and they have several adaptations that help them survive inundated conditions. In fact, their seeds are ideally water-dispersed that germinate during dry periods or on a damp surface like decaying logs and stumps. They have chemical responses to rapid changes in water level, which makes it the perfect species for seasonally inundated wetlands like the ones we have found hiking through different Guatemalan ecosystems. Flooded ecosystems have a low oxygen availability, to which *Cephalanthus occidentalis* is also adapted. To reduce oxygen demand and survive flooding, *Cephalanthus occidentalis* slows down its productions of roots and makes the stems grow higher and thicker. These adaptations, plus a tolerance to water pollution and variable soil nutrients, allow *Cephalanthus occidentalis* to thrive in a wide variety of wetland habitats.

Cephalanthus occidentalis' adaptations to Fire

Cephalanthus occidentalis is a plant that commonly grows in wetland areas which would be expected to have very few or no fires. However, when these areas are burned down, *C. occidentalis* has been observed sprouting within a few months. This only works of course if the plant has time to grow after the fire, because instances of places where fires happen yearly (mainly because of the use of slash-and-burn agriculture), have reported the disappearance of this species in the area. This ability to survive is due to a tough seed coat that protects the seed from being damaged or cracking during different conditions, like the heat from a fire. In turn, this tough coat makes it harder for the seed to absorb water which makes the embryo inside of it start to grow. This explains why in dry environments this species cannot survive. For *Cephalanthus occidentalis* seeds it is essential to have a wet soil to be able to resprout in a recently burned area.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica. Jun. 5, 2022.
Camera: iPhone 13 Pro Max.

What other Trees or Plants are often found in the same Habitat?

In North America, *Cephalanthus occidentalis* is commonly found in Oak-Hickory, Oak-Cypress, Elm-cottonwood and Maple forests. This means that they tend to share habitats in areas where these species are abundant (including *Quercus ellipsoidalis*, Quercus spp., *Populus spp.*, *Acer rubrum, Acer spp.*, *Betula spp.*, etc.) (Snyder 2018: 4).

In the coastal regions of the Gulf of Mexico, Lot (1991: 20) reports that *C. occidentalis* is found in the same habitats as some species of willows including Salix Negra, *S. caroliniana* and *S. chile*. Species of oak are also mentioned (especially *Quercus palustris*) as well as other trees like *Liquidambar styrciflua*, *Platanus occidentalis* and *Mimosa pigra*. Since there is little to no information on this species for the Guatemalan regions where *C. occidentalis* is distributed, we can use references from near-by areas (like the Mexican States of Campeche, Tabasco, Quintana Roo, etc.) to help us find information about related species and the ecosystems it is found in. This can give us an idea on where to find *C. occidentalis* in Guatemala.

Where has *Cephalanthus occidentalis* been found in the Parque Nacional Yaxha, Nakum and Naranjo?

There are no records found for *Cephalanthus occidentalis* in Parque Nacional Yaxha Nakum and Naranjo.

Where has *Cephalanthus occidentalis* been found in the Petén?

There is useful information on this website:

Click here to read more

Also, El Portal de Biodiversidad de Guatemala and The Field Museum of Natural History list several records of *C. occidentalis* found in different areas of Petén:

- Quexil Turicentro, bordering Lake Petén Itzá (1970)
- Near La Libertad, Petén (1972)
- Sayaxché, Petén by Steyermark (1942)
- Bordering Río Machaquila, north of aldea Machaquila (1975)
- Santa Elena, Petén (1970)

Are *Cephalanthus occidentalis* trees registered for Parque Nacional Tikal or Parque Nacional Yaxha Nakum Naranjo?

There are very few registered specimens of *Cephalanthus occidentalis* that we could find for Petén in general, and none of them are registered specifically for Parque Nacional Tikal nor PNYNN. The closest location where this species is registered is near Lake Petén Itzá in a collection from 1970, and most of the more recent records found online are from Mexico and the United States.

Brief list of *Cephalanthus occidentalis* trees for Belize by Standley and Record (1936)

> ***Cephalanthus occidentalis*** L. Maskall, Gentle 1254; United States to Honduras. A shrub or small tree; leaves opposite or ternate, ovate to lanceolate, acuminate, glabrous or pubescent; flowers small, white, in very dense, spheric heads 1 cm. or more in diameter; fruit dry, 2-4-celled, indehiscent.
>
> (Standley and Record 1936: 195).

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Jun. 5, 2022.
Camera: iPhone 13 Pro Max.

Cephalanthus occidentalis in Belize

Balick, Nee and Atha (2000: 141) list no uses by the local Mayan people in Belize, but the "Endemism hotspots in the flora of Belize" (Stott 2019: 192) do mention *Cephalanthus occidentalis* as a common shrub to find in these wetlands. Also, the author emphasizes the fact that more research is needed in these areas (Belize, Guatemala and bordering Mexico) to have updated information on the species.

Botanical Description of *Cephalanthus occidentalis* by Standley and Williams (1949)

> ***Cephalanthus occidentalis*** L. Sp. Pl. 95. 1753. Guayabillo. Figure 21. Swamps near sea level; Peten; Izabal. British Honduras (Maskall); Honduras; through Mexico to the United States and New Brunswick; Cuba; Old World.
>
> In Guatemala a shrub of 1.5 m., but often much larger or even a small tree (reported in Honduras as 5.5 m. high); stipules 2-4 mm. long, deltoid, acute or acuminate, usually with glands along the margin; leaves opposite or ternate, the petioles mostly less than 2 cm. long, the blades ovate to rarely narrowly lanceolate, 10-15 cm. long, 8.5 cm. broad or less, long- or short-acuminate, subcordate to acute at the base, glabrous above or nearly so, beneath almost glabrous or sometimes densely pubescent (var. *pubescens* Raf.); peduncles terminal and axillary, simple or branched, 3-10 cm. long; heads 6-12 mm. in diameter (excluding the corolla); bractlets filiformclavate; hypanthium and calyx together 2-3 mm. long, glabrous, or sparsely longpilose at the base, the calyx about 1 mm. long, shallowly dentate; corolla 5-9 mm. long, white or cream, glabrous outside, the limb with a small black gland in each sinus; capsule 4-8 mm. long. Known in the United States by the name "button-bush." The flowers are sweet-scented.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Jun. 5, 2022.
Camera: iPhone 13 Pro Max.

Is *Cephalanthus occidentalis* from the Maya Highlands or from the Maya Lowlands (or both)?

Neotropical Plant Portal lists primarily for Petén, along edges of rivers or lakes. It has never been collected from the savannas we have visited. With a permit from UVG herbarium we now have a sample found by Moisés Daniel Pérez Díaz for the world to know where else this plant flourishes.

Botanical Description of *Cephalanthus occidentalis* in Trees and Shrubs of Mexico

> ***Cephalanthus occidentalis*** L. Sp. Pl. 95. 1753. *Cephalanthus berlandieri* Wernham, Journ. Bot. Brit. & For. 55: 175. 1917. Chihuahua to Veracruz and Guerrero; reported from Tabasco. United States; Cuba; southern Asia. Shrub or small tree, sometimes 15 meters high; leaves opposite or ternate, ovate to narrowly lanceolate, 6 to 19 cm. long, acuminate, rounded to acute at base, glabrous or pilose beneath; heads 6 to 12 mm. in diameter, long-pedunculate, axillary and terminal; corolla 5 to 9 mm. long; capsule 4 to 8 mm. long; wood light, rather hard and close-grained, pinkish brown. "Jazmín" (Michoacan, Guerrero); "uvero" (Tabasco, Rovirosa).
>
> Known in the United States as "buttonbush." The bark is bitter, with tonic and laxative properties, and has been employed for periodic fevers. A poisonous principle, cephalanthin, which destroys the blood corpuscles and causes violent vomiting, convulsions, and paralysis, has been separated from it. The bark has been used also for palsy, coughs, and venereal and cutaneous diseases. The plant is said to yield a yellow dye.

(Standley 1926: 1368).

In which States of Mexico is *Cephalanthus occidentalis* listed by Villaseñor?

Villaseñor's Checklist of the native vascular plants of Mexico (2016: 314) lists the next 24 Mexican States where *C. occidentalis* can be found: Campeche, Chiapas, Chihuahua, Coahuila, Colima, Durango, Guerrero, Hidalgo, Jalisco, México, Michoacán, Morelos, Nayarit, Nuevo León, Oaxaca, Puebla, San Luis Potosí, Sinaloa, Sonora, Tabasco, Tamaulipas, Veracruz and Zacatecas.

World Range for *Cephalanthus occidentalis*

According to the report by the U.S. Department of Agriculture and Forest Service (2018: 3), this species' distribution extends from southern Quebec and Ontario through the eastern half of the United States, all the way to central and southern Mexico with some scattered populations listed in Guatemala, Cuba, Belize and Honduras.

Cephalanthus occidentalis in Izabal of Guatemala

The Portal de Biodiversidad de Guatemala lists no registered botanical reference for this species in Izabal. Also, this area is not included in the distribution map of Snyder (2018:3) or in any of the documents listed in this bibliography.

Photo by: Edwin Solares, FLAAR Messoamerica. Jun, 5. 2022.
Camera: Sony A1. Settings: 1/320; sec; f/13; ISO 1,000.

Cephalanthus occidentalis in Chiapas

Several references mention *C. occidentalis* as a species commonly found in the State of Chiapas. For example, as mentioned before, Villaseñor lists this species for Chiapas in the Checklist of the native vascular plants of Mexico (2016: 314). In the region of Pukté, Chiapas, according to the "Listado florístico del Norte de Chiapas" (Gutiérrez 2004: 109)

The "Listado florístico del Norte de Chiapas" (Gutiérrez 2004: 109) also lists *C. occidentalis* as one of the species that can be found specifically in the seasonally inundated area of Pukté, Chiapas, under the local name of "popal". The Global Biodiversity Information Facility (GBIF) website also lists dozens of records for *C. occidentalis* found by different researchers mainly in humid regions of Chiapas. Here we can notice the difference between information available about *C. occidentalis* for Mexican regions and Guatemalan regions. The lack of studies and registered specimens is evident since states like Chiapas (which border with Petén and have similar ecosystems) have several documents available about this species, and the whole area of Petén only has a handful of outdated references.

Cephalanthus occidentalis in Tabasco

The Botanical Society of Mexico (Sociedad Botánica de México) lists *C. occidentalis* for several states of Mexico. Tabasco is mentioned in this report as a region where this species is found (Hendrix 1961: 215). Villaseñor (2016:314) also lists Tabasco as a distribution area for *Cephalanthus occidentalis*, as well as some other references including the GBIF, and a report from the University of Tabasco, dedicated specifically to the distribution and diversity of trees in Tabasco (Ochoa and Arias 2002: 114).

An interesting fact about this species' distribution in Tabasco is that fossil records show that thousands of years ago some of these regions were flooded or partially flooded during long periods of time. As a result, *Cephalanthus occidentalis* replaced other tree species in the area (like *Annona glabra*) due to its higher flood tolerance (Noreen et al. 2008: 105). Nevertheless, recently this species' abundance has decreased with human presence in the area, due to things like human-induced fires.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Jun. 5, 2022.
Camera: iPhone 13 Pro Max.

Cephalanthus occidentalis in Campeche

Cephalanthus occidentalis is listed as native for most of the Mexican regions mentioned in this report, including Campeche. More specifically, documents like "Flora and vegetation of freshwater wetlands in the costal zone of the Gulf of Mexico" (Lot 1999: 20) mention that *C. occidentalis* is one of the main species found in the regions surrounding the Gulf. These areas include the coastal regions of Campeche, as well as other Mexican States like Tamaulipas, Veracruz, Tabasco, Yucatán and part of Quintana Roo. In Campeche specifically, the areas along Río Palizada are mentioned in this report as one of the most characteristic communities where *C. occidentalis* can be found.

Cephalanthus occidentalis in Quintana Roo

Quintana Roo is another state to which *C. occidentalis* is native to. Low floodable forests in this region are very biodiverse, and *C. occidentalis* is one of the species that can be easily found in these types of wetlands. A specific area in this state where biodiversity is preserved is the Sian Ka'an Biosphere Reserve. Here we can find that *C. occidentalis* is part of several "communities", which in this case means areas where the diversity is made up of different species, with one species that stands out. According to Lot (1991: 7), the most common communities where we can find *Cephalanthus occidentalis* include: "pucktales", where *Bucida buceras* stands out; "chechenales", a floodable forest where the species *Metopium brownei* stands out; and "tintales", here described as a lowland riparian forest where the species *Haematoxylum campechianum* is the highlighted species.

Do *Cephalanthus occidentalis* trees also grow in home gardens?

Since this species is very fond of wetlands and similar ecosystems, this makes it hard for *C. occidentalis* to be kept in a regular garden. Therefore, it is rare to see one of these bushes or trees planted in someone's home. Nevertheless, blogs about home "rain gardens" or "bog gardens" do mention it as a low maintenance plant that gives fragrant and beautiful white or pinkish-brown flowers. This bush can be trimmed to prevent it from growing into a tree, and apparently has a specific cultivar named "Sugar Shack" (trademark), which has a redder fruit and does not grow as tall as the wild strain. I highly recommend this as a garden plant because it makes butterflies, bees, and hummingbirds happy.

Are any parts of *Cephalanthus occidentalis* edible?

Some parts of this plant are reported to be unfit for human consumption because of the presence of certain glucosides. The leaves specifically contain cephalothin which can be toxic in large doses, but this chemical can be found in other parts of the tree like the bark and the roots.

Is there potential medicinal usage of *Cephalanthus occidentalis* by local people?

It yields a yellow dye and is listed by Standley (1926: 1368) in Trees and Shrubs of Mexico but is missing in most books on dye colorants of areas of Mesoamerica. In Belize it is not listed for dye nor any other use. But in fact, *Cephalanthus occidentalis* is mentioned in several documents as used for medicinal purposes by Native American tribes. A common example is the use of a strong decoctions made from the bark to treatdysentery (Campbell 1951: 86). The Meskwaki used the bark to induce vomit, while the Seminole reported to use the bark decoction as a cure for constipation (Smith 1928: 55). Modern research has found mild laxative effects with low doses of leaf and bark decoctions. There are also some reports of the leaves being chewed to help with urinary blockage, or decoctions to treat headaches and fever. Even so, as mentioned before, recent studies show that this plant contains chemicals that can be toxic to humans. In conclusion, the leaves, bark and even roots of *C. occidentalis* contain properties that can either cure or harm, so the best way to go for someone who is inexperienced is not to consume this plant.

Photo by: Edwin Solares, FLAAR Messoamerica. Jun, 5. 2022.
Camera: Sony A1. Settings: 1/320; sec; f/13; ISO 2,000.

Are any parts of *Cephalanthus occidentalis* trees or shrubs eaten by mammals?

Yes, deer eat the leaves (Branble and Goddard 1943 cited by Connor in Francis 2004: 171). Additionally, *Cephalanthus occidentalis'* flowers turn into fragrant red fruits which are persistent during winter. This makes its fruits available on a season in which food is scarce, feeding migrating birds, wood ducks, shorebirds, and other animals like small mammals. Ducks, especially the mallard (*Anas platyrhynchos*) feed off the seeds.

What are the primary pollinators of *Cephalanthus occidentalis* flowers?

Butterflies, honeybees, and hummingbirds (Connor in Francis 2004: 170, 171). In fact, this species is sometimes called "honeyball", because of all the attention it gets from bees due to its high nectar content. This of course is the reason why butterflies and hummingbirds love it too. Also, beetles and moths like the titan sphinx (*Aellopos titan*) and the hydrangea sphinx (*Darapsa versicolor*) are floral visitors for *C. occidentalis.*

Close relative(s) of *Cephalanthus occidentalis*; how many other species of *Cephalanthus* are in Petén?

Cephalanthus occidentalis is actually the only species of this genus that has registered collections for the Petén area. Both the Portal de Biodiversidad de Guatemala and Tropicos.com list only this species for the whole country.

Photo by: Edwin Solares, FLAAR Messoamerica. Jun, 5. 2022.
Camera: Sony A1. Settings: 1/200; sec; f/13; ISO 800.

Concluding Discussion
and Summary on *Cephalanthus occidentalis*

Since we have so many plants to handle, it is not realistic to do a PhD level of research on each plant. So for the moment I stick with the name of this plant by Standley and by Balick et al. I politely don't use the names by Lim (his work is awesome but to not mention the differences in names and locations in Latin America is noticeable).

Although it is currently not a common choice, I highly recommend *Cephalanthus occidentalis* as a garden plant because it makes butterflies, bees and hummingbirds happy.

So far it is not in our list of edible plants, mostly due to several chemicals that make them unfit for human consumption. But a lot more field work and library research are clearly needed, especially for the Guatemalan regions where this plant can also be found and is, in fact, native to. In the meantime, this FLAAR Report puts this plant into savanna ecosystem documentation (since Standley and colleagues a half century ago did not hike into these humid savannas).

Photo by: Edwin Solares, FLAAR Mesoamerica, Jun. 5, 2022.
Camera: Sony A1. Settings: 1/125; sec; f/9; ISO 2,000

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica. Jun. 5, 2022.
Camera: iPhone 13 Pro Max.

References Cited and additional Suggested Reading on *Cephalanthus occidentalis*

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. To help the world learn about the Itza Maya culture and eth nobotany, would be a courtesy of the author and publisher to make as an open searchable PDF as a helpful download.

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**

2015 Messages from the Gods: A Guide to the Useful Plants of Belize. The New York Botanical Garden, Oxford University Press.

BESTELMEYER, Brandon T. and **Leeanne E. ALONSO** (editors)

2000 A Biological Assessment of Laguna del Tigre National Park, Petén, Guatemala. RAP Bulletin of Biological Assessment 16, Conservation International, Washington, DC. 221 pages.

BRAMBLE, W. C. and **M. K. GODDARD**

1943 Seasonal browsing of woody plants by white-tailed deer in the bear oak forest type. *Journal of Forestry* 41(7): 471-475.

CONNOR, Kristina

2004 *Cephalanthus occidentalis* L. Pages 170-171 in Wildland Shrubs of the United States and Its Territories: Thamnic Descriptions: Volume 1, edited by John K. Francis. Gen. Tech. Rep. IITF-GTR-26. San Juan, PR: U.S. Department of Agriculture, Forest Service, International Institute of Tropical Forestry, and Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 830 pages.

ESTRADA Loreto, Feliciana

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

Helpful download: https://ecosur.repositorioinstitucional.mx/jspui/bitstream/1017/1656/1/1

FRANCIS, John K. (Editor)
2004 Wildland Shrubs of the United States and Its Territories: Thamnic Descriptions: Volume 1. Gen. Tech. Rep. IITF-GTR-26. San Juan, PR: U.S. Department of Agriculture, Forest Service, International Institute of Tropical Forestry, and Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 830 pages.

GONZÁLEZ ELIZONDO, M., ÁLVAREZ ZAGOYA, R., and **LÓPEZ ENRIQUEZ, R.**
2007 *Árboles y Arbustos de los Parques y Jardines del Norte-Centro de México (Guía de Identificación)*. Instituto Politécnico Nacional de México. 171 pages.

Available online: https://www.researchgate.net/profile/M-Socorro-Gonzalez-Elizondo/publi

GOODWIN, Z. A., LÓPEZ, G. N., STUART, N., BRIDGEWATER, G. M., HANSTON, E. M., CAMERON, I. D., MICHELAKIS, D., RATTER, J. A., FURLEY, P. A., KAY, E., WHITEFOORD, C., SOLOMON, J. LLOYD, A. J. and **D. J. HARRIS**
2013 A checklist of the vascular plants of the lowland savannas of Belize, Central America. Phytotaxa 101 (1): 1–119.

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

HENDRIX, Albert J.
1961 I*nforme sobre la vegetación actual de un sitio arqueológico de la civilización Chalchihuites y de sus alrededores, vecino a la ciudad de Durango, República Mexicana* 26th edition. Sociedad Botánica de México. 221 pages.

LIM, T. K.
2013 Edible Medicinal and Non-Medicinal Plants: Volume 5, Fruits. Springer. 943 pages.

His description of *Nauclea orientalis* is primarily from Thailand to Australia. Zilch mention of Mesoamerica. His photos show the same spherical ball on which the flowers sit. But his description is not related to the plant from Mesoamerica. And, ThePlantList does not mention any of his names. Let's hope botanists can sort out this mish-mash.

LOT, A.
1999 *Flora and vegetation of Freshwater wetlands in the Coastal Zone of the Gulf of Mexico*. Instituto de Biología, UNAM. 81 pages.

Available online: https://www.harteresearch.org/sites/default/files/inline-files/16.pdf

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

LUNDELL, Cyrus L.
1938 Plants Probably Utilized by the Old Empire Maya of Peten and Adjacent Lowlands. *Papers of the Michigan Academy of Sciences, Arts and Letters* 24, Part I:37-59.

NOREEN, C. M., TEBBENS, L. A., and **Del POZO, A. L.**
2008 *Tephrochronological evidence for the late Holocene eruption history of El Chichón Volcano, Mexico*. Geofísica Internacional. 112 pages.

Available online: https://www.redalyc.org/pdf/568/56813222008.pdf

OCHOA, S. and **ARIAS, V.**
2002 La distribución y fenología de la flora arbórea del estado de Tabasco con base en la información de Herbario. Universidad Juárez Autónoma De Tabasco. Volume 18. 127 pages.

Available online: https://www.redalyc.org/pdf/154/15403603.pdf

SNYDER, S. A.
2018 *Cephalanthus occidentalis*. U.S. Department of Agriculture, Forest Service, International Institute of Tropical Forestry, and Fort Collins, CO: U.S. Department of Agriculture, Forest Service. 25 pages.

Available online: https://www.fs.usda.gov/database/feis/plants/shrub/cepocc/all.html

STOTT, G.
2019 *Endemism hotspots in the flora of Belize*. Oxford University. 212 pages.

QUATTROCCHI, Umberto
2016 CRC World dictionary of medicinal and poisonous plants: common names, scientific names, eponyms, synonyms, and etymology. Vol. 5. 3960 pages.

STANDLEY, Paul C.
1926 Trees and Shrubs of Mexico. *Contributions from the United States National Herbarium*, Volume 23, Part 5, pages 1313 to 1721. Smithsonian Institution.

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

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

WIHELM, A., and RERICHA, J.
2019 *Illustrated Glossary of Botanical Terms*. Indiana Academy of Science.

Available online: http://conservationresearchinstitute.org/forms/CRI-FLORA-Glossary.pdf

APPENDIX A

Crucial Information on *Cephalanthus occidentalis* by Kristina Connor in Francis 2004: 170-171

So far I have not yet found this plant in Flora of Guatemala of Standley and Steyermark or Standley and Williams; only in Standley 1926 in *Trees and Shrubs of Mexico*. Since it is missing from key monographs on flora of Guatemala, it is helpful do provide the information by Connor. I put only the information pertinent to ecosystems and ethnobotany:

> **General Description**.—Buttonbush, also known as buttonball, button willow, common buttonbush, honey-bells, globe-flower, and riverbush, is a deciduous, wetland shrub or small tree that can reach 6 m in height but generally averages 1 to 3 m tall. The trunk base is often swollen (Snyder 1991). Branches are generally green when young but darken upon maturity and have conspicuous, raised lenticels (Brown and Kirkman 1990). The short-petioled glossy green leaves are elliptic or lanceolate-oblong; they are mostly opposite but, on the same plant, can occur in whorls of three or four. Leaves range in size from 7 to 18 cm in length and are 4 to 10 cm wide.
>
> **Range**.—Buttonbush is common along stream and pond borders, in swamps, floodplains and other riparian areas throughout the eastern half of the United States. It occurs naturally in southern Nova Scotia, New Brunswick, Quebec, and Ontario as well as through the eastern half of the Great Plains States; scattered populations and varieties are found in Arizona, New Mexico, southern California, and Texas. It also grows in Mexico, Cuba, Central America, and in the West Indies (Little 1979). Recognized varieties are *C. occidentalis* L. var. *californicus* Benth., *C. occidentalis* var. *pubescens* Raf., and *C. occidentalis* var. *angustifolius* Dippel.
>
> **Ecology**.—Buttonbush is a wetland species that cannot tolerate drought. It commonly grows in thickets in areas that have intermittent flooding. The open, rangy plant is not particularly attractive and is seldom found in cultivation today, although Van Dersal (1938) and Vines (1960) reported that it was cultivated as early as 1735 as a honey plant. The creamy white summer flowers of buttonbush attract butterflies, honeybees, and hummingbirds. While it is common in natural environments, its habitat is threatened in California and it grows poorly along manmade waterways (Holstein 1984). Faber-Langendoen and Maycock (1989) state that buttonbush abundance increases with increasing depth of water and light levels, while Holstein (1984) suggests distribution may be limited by mean July temperatures of 20°C. It is classified as a pioneer species and grows best in wet areas that receive full sun. It is able to tolerate some salinity that might result from hurricane storm surges but will not survive long-term exposure to salt water (McCarron and others 1998).

Growth and Management.—Buttonbush is a fast growing but short-lived shrub. It can be used as a landscape shrub border but if not planted in moist soil, it must be watered frequently. It must also be pruned to maintain a good form. In nature, buttonbush occurs in dense thickets. It will resprout after fire (Vogl 1973, Wade and others 1980). It has no reported pest problems but is moderately sensitive to herbicides. Thickets can be reduced by cutting.

Benefits.—Buttonbush seeds are an important food for water birds but can be toxic to other animals (Snyder 1991). Dense buttonbush thickets provide a safe nesting ground for many wetland birds. Buttonbush also serves as a source of honey for butterflies, bees, and hummingbirds. A decoction of the inner bark was used by Native Americans as an emetic. The bark was also used as a substitute for quinine. The wilted leaves, which contain bitter glycosides, cephalin and cephalanthin (ACES 2001), are reportedly toxic to some animals, especially cattle that eat them when other foliage is scarce. However, buttonbush leaves are eaten by deer (Bramble and Goddard 1943), apparently with no ill effects. Other plant parts are less toxic.

Very important observation by Connor is that it can resprout after fire.

A few comments by Hellmuth: since the savannas are burned every year or so this plant does not have time to grow to the size of a tree. The temperatures in the full sun of a savanna approach over 40 degrees C in a warm month.

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/

http://legacy.tropicos.org/NameSearch.aspx?pro
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?cate
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/imagedatab-
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

- **BACK COVER PHOTOGRAPH**

  Photo by: Nicholas Hellmuth,
  FLAAR Mesoamerica. Jun. 5, 2022.
  Camera: iPhone 13 Pro Max.

ACKNOWLEDGEMENTS TO FLAAR MESOAMÉRICA

Flor de María Setina is in charge of the financial administration of the institution and supports the supervision of daily activities.

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.

Roberto Aguiar history 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.

Byron Pacay is our assistant during field trips to handle GPS data. He also assists in the main office with different tasks.

Norma Cho is a helpful photography assistant during field trips. She also assists in the main office with different tasks.

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.

Haniel López is a drone pilot and photographer during our expeditions.

Pedro Pablo Ranero with a degree in communication is responsible for editing videos of flora and fauna to create content on our sites.

Andrea Sánchez 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.

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

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

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

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

Karla Cho helps with general research and design assistant in the office.

Luis Molina is a professional illustrator specialized in line drawings of Maya vases, bowls, and plates.

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, She is in charge of directing the animation area of our MayanToons project.

Paula García is part of our MayanToons animation team. Her job is to bring our favorite characters to life.

Niza Franco is part of our MayanToons animation team. Her job is to bring our favorite characters to life.

Isabel Trejo is a graphic designer and illustrator for MayanToons and for social media posts.

Andrea Bracamonte is a graphic designer and illustrator for MayanToons and for social media posts.

Josefina Sequén is an illustrator for MayanToons.

Rosa Sequén is an illustrator for MayanToons.

RESERVA DE LA BIÓSFERA MAYA - RBM -
DEPARTAMENTO DE PETÉN, GUATEMALA

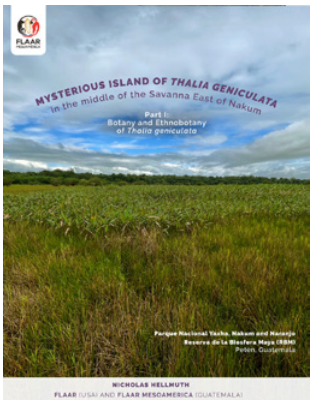
FLAAR MESOAMÉRICA

Google Maps 2022; Asociación de Comunidades Forestales de Petén - ACOFOP - 2011; Wikimedia Commons 2019

Other publications on RBM Project

Documenting our remote field work
Download now

Epiphytes in Tikal
Download now



Island of *Thalia geniculata*
Download now

Fruits of *Gaussia maya* palms
Download now

Bats from El Zotz
Download now

Tasistal Ecosystem, Savanna #24
Download now

Corozera, Palm Area South of Nakum
Download now

Nasua narica-Coatimundi
Download now

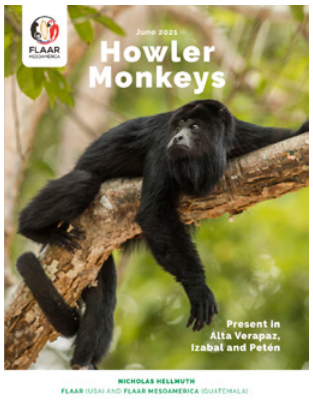
Wild Vanilla Orchid, Vanilla insignis
Download now

If you wish more FLAAR reports on RBM Project of Guatemala, visit our website:
https://flaar-mesoamerica.org/reserva-biosfera-maya-project/

Other publications of
the fauna of Guatemala

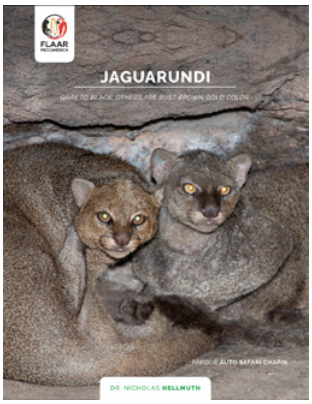
Protect Howler Monkeys
Download now

Mantled, Howler Monkeys
Download now

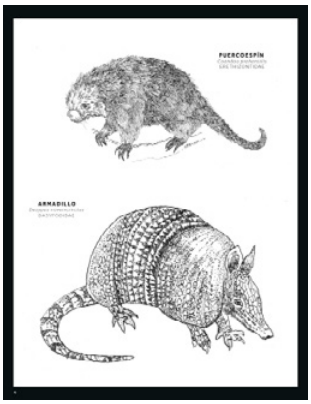


Howler Monkeys
Download now

Spider Diversity of Alta Verapaz
Download now



Jaguarundi
Download now



Wild animals of the Mayan World
Download now

Honey Bees
Download now

Listado actualizado de los Mamíferos de Guatemala
Download now

If you wish more FLAAR reports on fauna of Guatemala, visit our website:
https://flaar-mesoamerica.org/product-category/ethnozoology/

Other publications of the flora of Guatemala

Symphonia globulifera
Download now

Pital Ecosystem
Download now

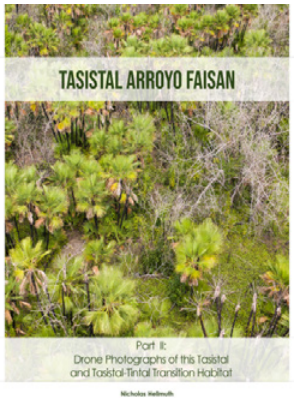
Guarumo buds
Download now

Importancia del Dosel de los Bosques Tropicales
Download now

Pachira aquatica
Download now

Cucurbita lundelliana
Download now

Acrostichum aureum
Download now



Tasistal Arroyo Faisan
Download now

Hoja de Piedra
Download now

If you wish more FLAAR reports on flora of Guatemala, visit our website:
https://flaar-mesoamerica.org/product-category/ethnobotany/


FLAAR
MESOAMÉRICA
FLAAR