



CACAO KUK

— *Stenanona stenopetala* —

Municipio de Livingston,
Izabal, Guatemala

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CACAO KUK

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Izabal, Guatemala

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Camera: Google Pixel 6.



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GLOSSARY

Cauliflora: Production or appearance of flowers and/or fruits on well developed trunks or major branches (New South Wales Flora, 2022).

Inflorescence: Cluster of flowers or/and fruits on a branch, stem or system of branches/ stems. The flowers in an inflorescence are found in an arrangement or specific pattern on a stem or axis (Britannica, 2018; New South Wales Flora, 2022).

Monocarpic plant: Plants that flower and produce seeds only once in their lifetime, which means they have only one opportunity to reproduce before completing their life cycle (Lal , 2003).

Pedicles: Small, thin stem that connects a flower or group of flowers (inflorescence) to the main stem of the plant. It supports the flower and/or inflorescences, rising above the plant, allowing the flowers to be more visible and accessible for pollination (Beentje, 2010).

Pendulous Flowers: Flowers or inflorescences hanging down, pendant or declined from stems or branches. The flowers hang more inclined than horizontal (Missouri Botanical Garden, 2010).

Pollen: Microscopic reproductive structures produced by the angiosperm's flower anthers, or by the equivalent structures in the non-flowering plants gymnosperms. Pollen contains the male sex cells of a plant called "sperm cells". The main function of pollen is the fertilization of the female plant cells called "ovules", for the formation of seeds (McCormick, 2013).

Sepals: Modified leaf structures that surround and protect the reproductive parts of a flower in its early development phase. Sepals are leaf-like, and they are found on the outermost whorl of a flower (University of Alaska Fairbanks, w.d.).

Whorls: Also called "verticil". Arrangement of leaves, sepals, petals, stamens or carpels that radiate from a single point and surround or/and wrap around the stem or stalk. Consider that a pair of opposite leaves is not called or is a whorl; whorls must consist of at least three or more elements/ plant organs (Beentje, 2010; DBpedia, w.d.)

INTRODUCTION TO ***STENANONA STENOPETALA***

The Annonaceae family forms the group of plants with generous fruits in terms of their taste and smell, these have been cultivated since the times of our Mayan ancestors and are currently cultivated throughout the tropics of the world. The Annonaceae family distributes from Africa, Asia, Central and South America to Australia, making it a tropical and subtropical plant group (Ekundayo, 2011) . The family includes about 120 genera and about 2,000 species. Their fruits, in their great diversity, satisfy those who seek sweet, sour and/or bitter flavors and smells (Aguirre, 2014).

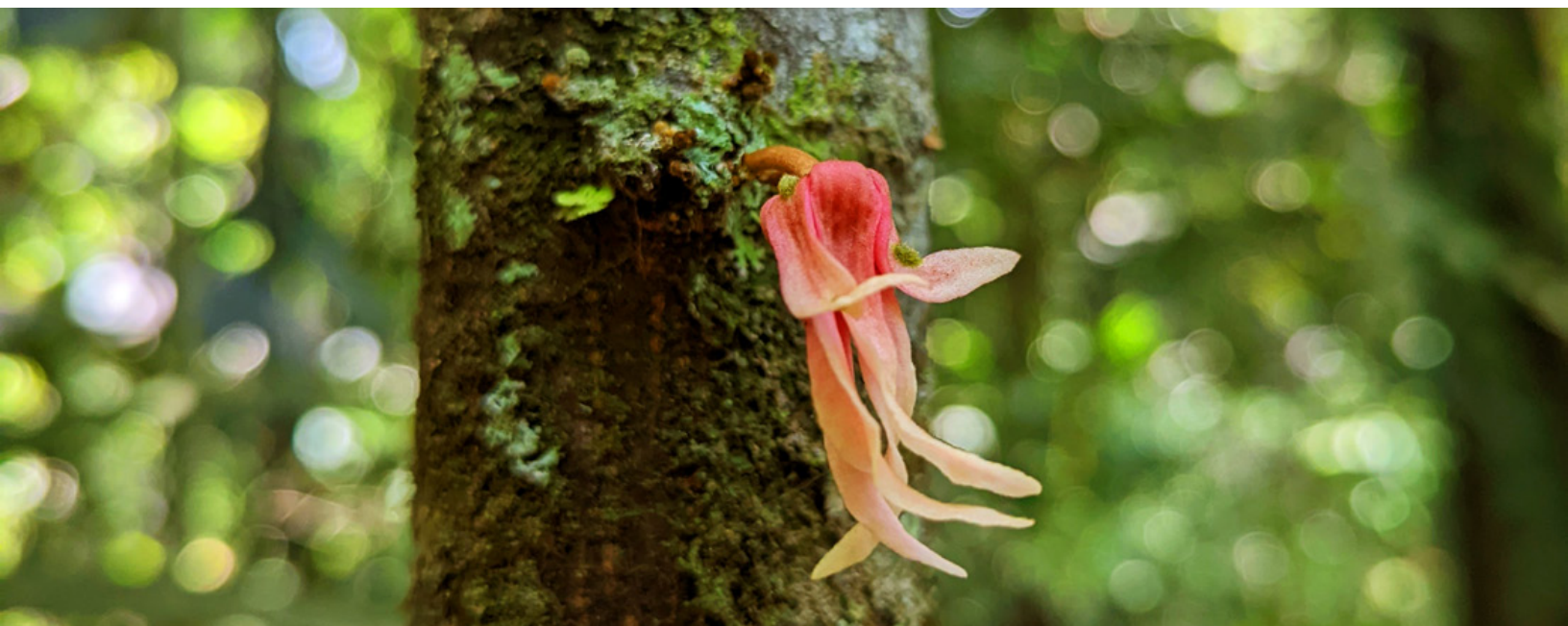
The Annonaceae can become trees and shrubs, sometimes climbers plants. They have entire, alternate leaves, without stipules. Flowers are generally bisexual, axillary, rarely terminal. They have 3 sepals, free or united in various ways, 3-6 petals usually arranged in two whorls, and numerous spirally arranged stamens. The fruits are without fleshy or woody carps or free monocarps (Kessler, 1979). The seeds are big. Some species produce edible fruits, while others obtain essential oils or spices. As timber-producing trees, they have only some

local importance. The genera *Annona*, *Asimina*, *Monoon* and *Cananga* are cultivated (Sánchez, w.d.).

In general, the knowledge of the cultivation of the Annonaceae family is incipient and rustic. However, it's known that the Annonaceae plants grow with little need for care in captivity. In different countries (México, Guatemala for example), farmers propagate these plants by pruning and fertilizing them to stimulate their growth and development. Although these plants are exploited in many countries, due their varied ethnobotanical uses and biological characteristics (Zorofchian, *et.al.*, 2015), their commercialization does not transcend the local markets. In general, the knowledge of the Annonaceae family cultivation is incipient and rustic (Aguirre, 2014), which shows the importance of continuing and expanding the scientific studies on this group of plants.

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In the American continent, the genus *Stenanona* is distributed from Mexico to Colombia, being native mainly to Central America. To date, fifteen (15) species are contemplated within this genus (González, 2015). The genus includes small trees, reaching a size of up to 6 meters tall, with black bark, densely golden young branches. Their leaves are elliptic-ovate to obovate, with 9.4 to 21.9 cm long and 3.2 to 8 cm broad, pointed apex, rounded to obtuse base, membranaceous, entire margins, sparsely ciliated. The inflorescences are ripid, with one flower at a time, arranged in perennial nodes and concentrated along the main trunk. These plants have pendulous flowers and pedicels 4 to 6 mm long. Their fruits are a fascicle of connivent berries, spherical monocarps, with 2.5 cm in diameter, opaque red when ripe (Van Heusden, 1992).



Stenanona stenopetala, Cacao kuk.

Photo by: Roxana Leal, FLAAR Mesoamerica, Aldea El Rosario, Livingston. Apr. 8, 2022.
Camera: Google Pixel 6.

PERSONAL EXPERIENCE

BY VICTOR MENDOZA, RESEARCHER

In October 2020, expeditions began to be carried out to different places in the Guatemalan Caribbean as part of our project: "Livingston Biodiversity Documentation". Our director, Dr. Nicholas Hellmuth, has a great interest in cauliflorous plants, as they are represented in Classic Mayan art. As these expeditions were carried out, we found and identified different plants with this quality. The rangers who guided us on the different trails of the Livingston rainforests showed us amazing plants with this quality, and among them they showed us the famous "Cacao Kuk", a very striking plant with red fruits. This plant with scientific name *Stenanona stenopetala*, is only documented and found mainly in Mexico, Belize and Guatemala, which made the encounter of this plant in the field much more interesting. However, it was until 2022 that we were able to appreciate the flower of this plant, and to be able to identify the species. Since this is an uncommon plant to be found in the field, it has been poorly studied, which enhances the importance of encouraging the research for the species. The residents of Livingston do not give any use to the plant, however we continue to investigate whether this plant has any use or potential in other places and communities.



Stenanona stenopetala, Cacao kuk

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Jul. 2, 2021.
Camera: iPhone 12 Pro Max.

FULL BOTANICAL NAME

Stenanona stenopetala (Donn.Sm.)
G.E.Schatz

Reference source:

<https://www.gbif.org/es/species/3156556>

SYNONYMS FOR

STENANONA STENOPETALA

- *Desmopsis stenopetala* (Donn.Sm.) R.E.Fr.
- *Porcelia stenopetala* Donn.Sm.
- *Sapranthus stenopetalus* (Donn.Sm.) Saff.
- *Sapranthus stenopetalus* (Donn.Sm.)
Saff. ex Standl.
- *Stenanona stenopetala* (Donn.Sm.)
G.E.Schatz ex Maas, E.A.Mennega
and Westra.

Reference source:

<https://www.gbif.org/es/species/3156556>

LOCAL NAMES FOR

STENANONA STENOPETALA

- "Cacao Kuk"; Ku'uK means squirrel in Yucatec Mayan
- "Cacao de montaña"
- "Cacao de ardilla"

Stenanona stenopetala, Cacao kuk

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica,
Jul. 2, 2021. Camera: iPhone 12 Pro Max.



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

“Cacao de montaña” (mountain cacao) is what *Theobroma angustifolium* is called, which belongs to the same genus as cacao tree (*Theobroma cacao*).

Reference source: <https://ecuador.inaturalist.org/taxa/286417-Theobroma-angustifolium>

HABITAT OF **STENANONA STENOPETALA**

In tropical moist forest, often on limestone. At elevations of 200–800 m (Schatz & Maas, 2010).

BOTANICAL DESCRIPTION OF **STENANONA STENOPETALA**

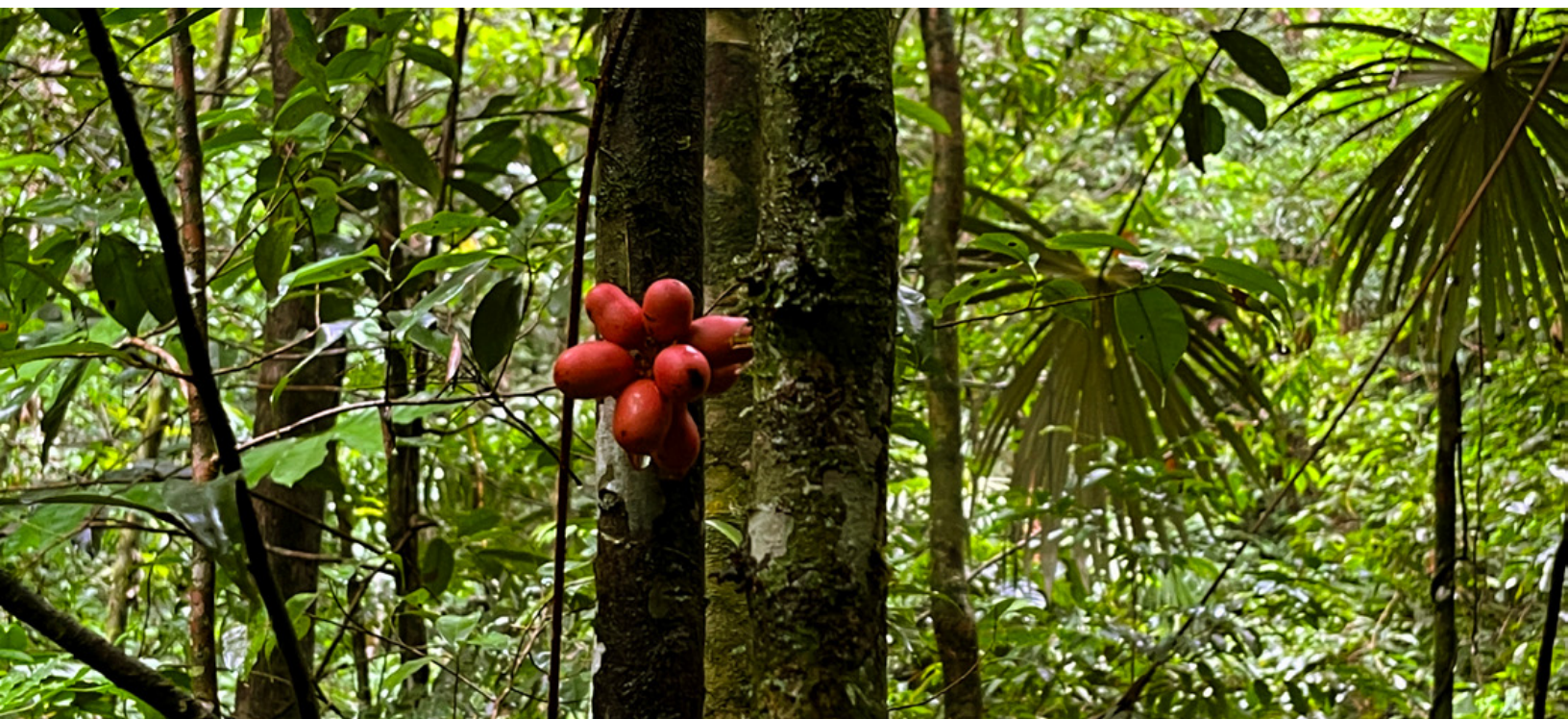
Stenanona stenopetala epitomizes the confusion surrounding generic delimitation among the genus *Desmopsis*, *Sapranthus*, and *Stenanona* in Central America. Neither Fries’s (1930) claim that the petals lack prominent venation, nor that they exhibit a thickness characteristic of *Desmopsis* are justified. Longitudinal venation is clearly evident in rehydrated petals, and the degree of fleshiness and thickness (and hence stiffness) fall well short of that characteristic of *Desmopsis* species, but rather agrees well with other *Stenanona* species. Further, pollen shows no evidence of aperture formation, unlike all *Desmopsis* species thus far examined (Schatz 1987). In vegetative aspects, the dark, glossy green lamina above that dries matte greyish green, as well as the dense golden brown indument of secondary veins and primary vein below, and ciliate leaf margin, are very reminiscent of *S. carrillensis* and *S. hondurensis*. Among the *Stenanona* species with free petals, *S. stenopetala* is distinguished by its mostly pinkish and relatively shortly pedicellate flowers, which are produced from the main trunk, by a usually 3-merous perianth, and by small sepals relative to the petals (Schatz and Maas, 2010).

KEY TO THE **SPECIES STENANONA**

1. Inner and outer petal whorls fused for some portion of their length 2
1. Inner and outer petal whorls free 5
2. Inner and outer petal whorls fused for 17 mm or more, i.e., for nearly 50 % of their length or more; carpels c. 30; monocarps shortly stipitate with stipes 2–4 mm long 3
2. Inner and outer petal whorls fused for 4–5 mm, i.e., for less than 10 % of their length; carpels 2–10; monocarps sessile 4
3. Inner and outer petal whorls fused for nearly 1/2 of their length; sepals 9–22 mm long; keel on the inside of the petals lacking. — Colombia (Chocó) 3. *S. columbiensis*
3. Inner and outer petal whorls fused for nearly 3/4 of their length; sepals 24–26 mm long; keel on the inside of the petals present. — Panama 13. *S. tubiflora*
4. Bracts alternate, 1 mm apart; inflorescences mostly borne on horizontal branches (ramiflorous); ovules 2–4, uniseriate; monocarps smooth. — Panama, Costa Rica 10. *S. panamensis*
4. Bracts opposite; inflorescences mostly borne on the main trunk (cauliflorous); ovules c. 8, biseriate; monocarps bearing lamellar, lacerate excrescences. Nicaragua, Costa Rica 4. *S. costaricensis*
5. Inflorescences borne on flagella running over the surface of the ground (flagelliflorous); petals < 15 mm long, lacking a long drawn-out apex. — Mexico (Oaxaca, Veracruz) 5. *S. flagelliflora*
5. Inflorescences borne among leaves, on horizontal branches, or on the main vertical trunk; petals > 20 mm long, with a long, drawn-out apex 6
6. Inner and outer petals equal to subequal, linear to lineartriangular; plants not clonal; ovules > 2 7
6. Inner and outer petals unequal, the outer petals linear to narrowly triangular, the inner ones narrowly ovate-triangular; plants clonal, spreading vegetatively by underground stolons (unknown for *S. monticola*); ovule 1 12
7. Flowers 3-merous (very rarely 4-merous in *S. stenopetala*); sepals free 8
7. Flowers 4-merous; sepals basally connate 10
8. Lamina with 7–9 secondary veins on either side of primary vein; monocarps with distinct stipes 10–13 mm long. — Colombia (Nariño) 9. *S. narinensis*
8. Lamina with 10–17 secondary veins on either side of primary vein; monocarps sessile or with stipes up to 3 mm long . . 9

9. Pedicels 9–23 mm long; sepals 2–3 mm long; monocarps ellipsoid to subglobose, stipitate, the surface smooth and verrucose. — From Mexico to Belize . . . 11. *S. stenopetala*
9. Pedicels 2–5 mm long (but to 10 mm in fruit!); sepals 6–15 mm long; monocarps subglobose, sessile, the surface irregularly tuberculate. — Honduras 12. *S. tuberculata*
10. Lamina glabrous below; inflorescences borne on the main vertical trunk (cauliflorous); pedicels 8–12 mm long. — Mexico (Chiapas, Tabasco) 2. *S. cauliflora*
10. Lamina densely covered with erect, golden brown hairs (velutinous) below; inflorescences borne among leaves; pedicels 60–200 mm long 11
11. Secondary veins 13–20 on either side of primary vein; petals 5–8 mm wide at base, cream throughout. — Costa Rica 1. *S. carrillensis*
11. Secondary veins 9–13 on either side of primary vein; petals 2–4 mm wide at base, dark purple to wine red for basal 1/3 and then cream to ochre yellow above. — Honduras. *S. hondurensis*
12. Pedicels 3–7 mm long; petals 5–11 mm long. — Mexico (Oaxaca, Veracruz, 230–700 m) 14. *S. wendtii*
12. Pedicels 9–21 mm long; petals 10–44 mm long 13
13. Petals 23–44 mm long; sepals c. 3 mm long; pedicels sparsely hairy; plants without minute, lens-like warts. — Mexico (Chiapas, Veracruz, 100–140 m) 7. *S. humilis* 13.
- Petals 10–20 mm long, sepals 1.5–2 mm long; pedicels (rather) densely hairy; leaves and monocarps covered with minute, lens-like warts. — Mexico (Chiapas, 1000– 1250 m) 8. *S. monticola*

(Schatz & Maas. 2010).



Stenanona stenopetala, Cacao kuk

Photo by: Roxana Leal, FLAAR Mesoamerica, Río Sarstún, Lagunita Creek, Livingston. Jul. 2, 2021.
Camera: Google Pixel 3XL.



CLOSE RELATIVE(S) OF ***STENANONA STENOPETALA***

- *Stenanona cauliflora*
- *Stenanona flagelliflora*
- *Stenanona humilis*
- *Stenanona migueliana*
- *Stenanona monticola*
- *Stenanona tuberculata*
- *Stenanona wendtii*

Stenanona stenopetala, Cacao kuk

Photo by: Roxana Leal, FLAAR Mesoamerica, Río Sarstún, Lagunita Creek, Livingston. Jul. 2, 2021.
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Stenanona stenopetala, Cacao kuk

Photo by: Roxana Leal, FLAAR Mesoamerica, Río Sarstún, Lagunita Creek, Livingston. Jul. 2, 2021.
Camera: Google Pixel 3XL.

WHERE HAS *STENANONA STENOPETALA* BEEN FOUND IN THE MUNICIPIO OF LIVINGSTON?

Stenanona stenopetala was found at two different locations in Livingston Township on two different dates.

- The first time it was found on the Cerro Sarstún trail, was on July 2, 2021 in our expedition in the entire area of Río Sarstún, presenting only the red fruits.
- The second time this plant was found in Aldea El Rosario, where our resource guard Lucas Cuz informed us that it was giving flowers, this was documented on March 8, 2022.



Stenanona stenopetala

Photo by: Víctor Mendoza, FLAAR Mesoamerica, Aldea El Rosario, Livingston. Apr. 1, 2022.
Camera: Sony Alpha A7C. Settings: 1/200; sec; f/2.8; ISO 1,600.

IS *STENANONA STENOPETALA* FROM THE **HIGHLANDS OR FROM THE LOWLANDS (OR BOTH)?**

It is from lowlands, it can be found below 800 meters above sea level (Schatz and Maas, 2010).

WORLD RANGE FOR *STENANONA STENOPETALA*

Distribution — Belize (Toledo), Guatemala (Alta Verapaz, Huehuetenango, Petén) to Mexico (Chiapas, Tabasco) (Schatz and Maas, 2010: 206).

Reference source: <https://enciclovida.mx/especies/200874>



Stenanona stenopetala

Photo by: Victor Mendoza, FLAAR Mesoamerica, Aldea El Rosario, Livingston. Apr. 1, 2022.
Camera: Sony Alpha A7C. Settings: 1/200; sec; f/2.8; ISO 1,600.

STENANONA STENOPETALA IN BELIZE

Syn: *Desmopsis stenopetala* (Donn. Sm.) R.E. Fr. — Ref: FG 4: 285. 1946; Schatz, 1987: 265. — Habit: Tree. — Voucher: Gentle 7220; Gentry 8165; Schipp 698 (Balick et.al., and Atha 2000).

STENANONA STENOPETALA IN MEXICO

Stenanona stenopetala (Donn. Sm.) G.E. Schatz CHIS, TAB (Viseñor, 2016).

STENANONA STENOPETALA IN GUATEMALA

Stenanona stenopetala (Donn.Sm.) G.E.Schatz ex Maas, E.A.Mennega and Westra First published in *Candollea* 49: 465 (1994). - The native range of this species is SE. Mexico to Guatemala. It is a tree and grows primarily in the wet tropical biome (Balick, 2000; Royal Botanic Gardens Kew, 2022).



***STENANONA STENOPETALA* RELATION WITH MAMMALS AND POLLINATORS**

ARE ANY PARTS EATEN BY MAMMALS?

Yes! Squirrels feed on its fruits, which is why one of its common names is "Cacao de ardilla" (Squirrel Cacao).

WHAT ARE THE PRIMARY POLLINATORS OF FLOWERS?

Annonaceae are pollinated mainly by bees and beetles (Peña 2003: 9).



Stenanona stenopetala

Photo by: Roxana Leal, FLAAR Mesoamerica, Aldea El Rosario, Livingston. Apr. 8, 2022.
Camera: Google Pixel 6.

CONCLUDING DISCUSSION AND SUMMARY ON *STENANONA STENOPETALA* TREES

Stenanona stenopetala is a species of tree, no more than 6 meters tall that belongs to the Annonaceae family. This plant species has been poorly studied in Guatemala; however, there has been research for this genus *Stenanona* in other countries, mainly in Mexico.

FLAAR Mesoamerica urges the Guatemalan and Mesoamerican scientific community to increase the research efforts for this plant species, since it is found in our territory and could have some unique potential of its kind in the ethnobotanical or industrial fields.

For more summarized information, visit our new web at:

<https://flaar-mesoamerica.org/2022/05/12/we-found-the-cacao-de-montana-flowers-stenanona-stenopetal/>

Records in herbaria "Portal de Biodiversidad de Guatemala."

<https://biodiversidad.gt/portal/collections/list.php?usetes=1&taxa=10436>



Stenanona stenopetala

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Río Sarstún, Lagunita Creek, Livingston. Jul. 2, 2021.
Camera: iPhone 12 Pro Max.



Stenanona stenopetala

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Río Sarstún, Lagunita Creek, Livingston. Jul. 2, 2021.
Camera: iPhone 12 Pro Max.

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WEB SITES SPECIFICALLY **ON *STENANONA STENOPETALA***

<https://www.gbif.org/es/species/3156556>

Taxonomy and Botanical information

<https://powo.science.kew.org/taxon/>

Botanical information

<https://enciclovida.mx/especies/200874>

Distribution of species

<http://legacy.tropicos.org/Name/40005243>

Biology of *Stenanona* spp.

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/>

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>.

This is the main SEARCH page.

<https://plantidtools.fieldmuseum.org/pt/>

SEARCH page, but only for the collection of the Field Museum herbarium of Chicago.

<https://fieldguides.fieldmuseum.org/>

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/

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 one of the most reliable botanical web site to find synonyms.

WEB SITES SPECIFICALLY **ON LACMELLEA STANDLEYI**

<https://www.tropicos.org/name/1801326>

Accepted names and synonyms

<http://legacy.tropicos.org/name/01801326?projectid=3>

General description and map distribution

<https://biodiversidad.gt/portal/taxa/taxonomy/taxonomydynamicdisplay.php?target=8909>

Biodiversity portal of Guatemala, allows you to consult online herbaria samples of this species

<http://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:134507-2>

Range and distribution

<https://eol.org/pages/5326697>

Lacmellea species list and its range distribution

<http://www.theplantlist.org/tpl1.1/record/kew-106787>

Accepted synonym provided by The Plant List: *Zchokkea standleyi* Woodson

<http://herbanwmex.net/portal/taxa/index.php?taxon=130553>

Herbarium photos and references

<http://tropical.theferns.info/viewtropical.php?id=Lacmellea+standleyi>

Information

ACKNOWLEDGEMENTS TO FLAAR MESOAMÉRICA

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

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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.

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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.

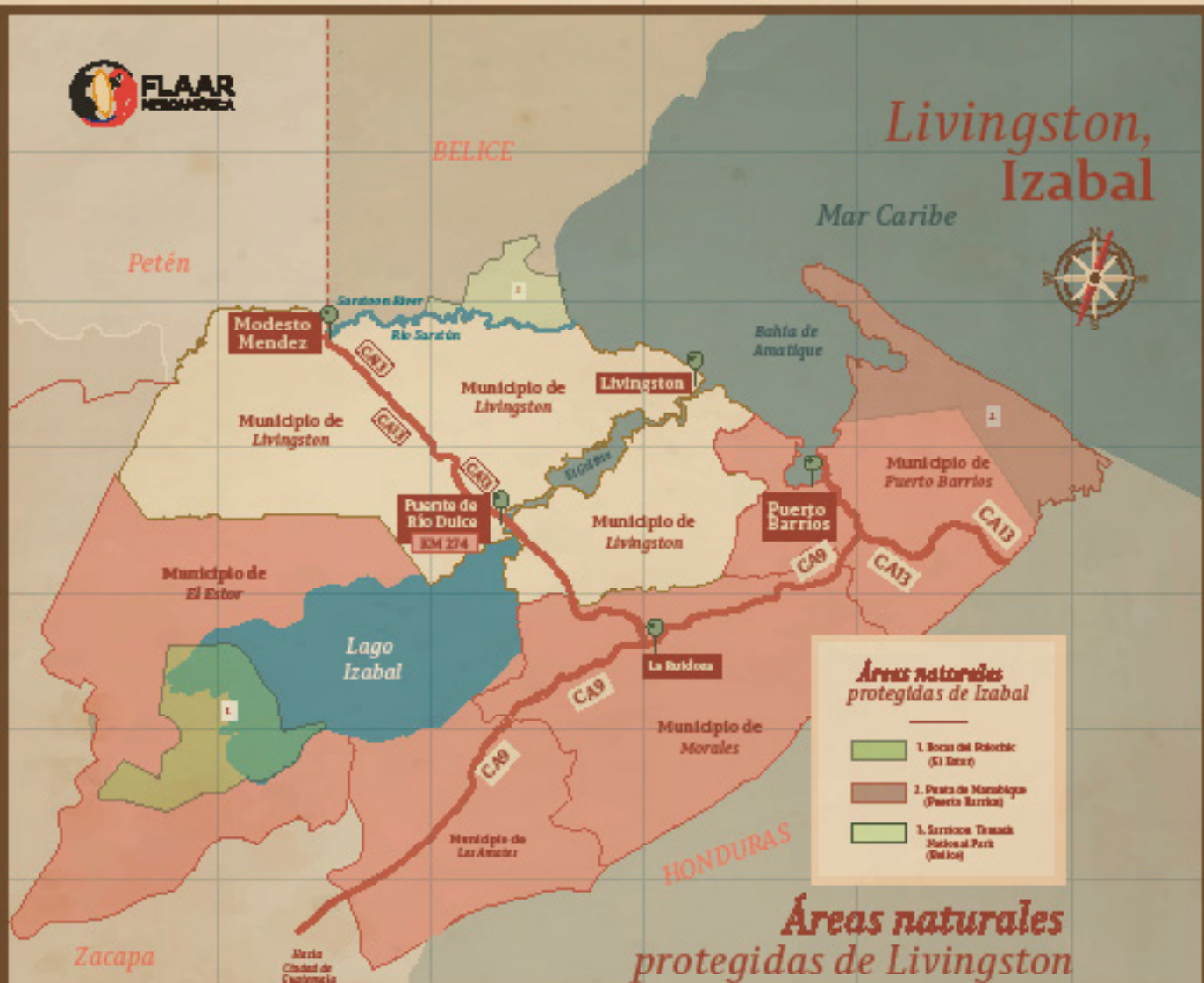
Josefina Sequén is an illustrator for MayanToons.

Rosa Sequén is an illustrator for MayanToons.

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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

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Reserva Natural Tapón Creek, Livingston

Bahía de Amatique

Área de Usos Múltiples Río Sarstún

Punta Cocolí

Aldea Buena Vista Tapon Creek

San Juan

Reserva Natural Tapón Creek
Municipio de Livingston

Siete Altares

Finca Gangaditwali

Sarstún Creek

Taponcito Creek

El Rosario

San Martín

La Desmembración

Plan Grande Tutín

Área de Usos Múltiples Río Sarstún

El Mach Creek

Biotope Chocón Machacas

Cállix Creek

Laguna Salvador

Laguna Cállix

Laguna Nueva

El Golfete

Parque Nacional Río Dulce

Cañón Río Dulce

Río Tatin

Río Creek Salvador

Río Tapon Creek

Río San Martín

Río Tapon Creek

Río Cocolí

Río Loto Creek

Río Cállix Creek



Izabal



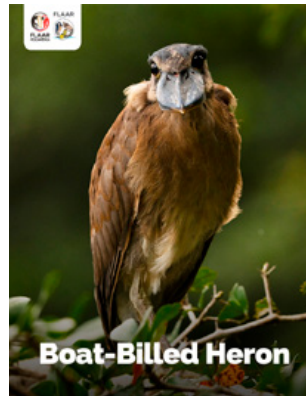
Información de referencia:

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

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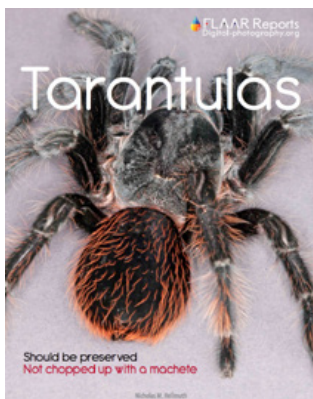
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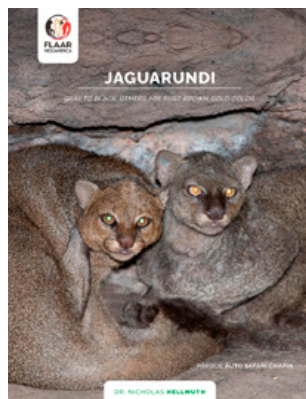
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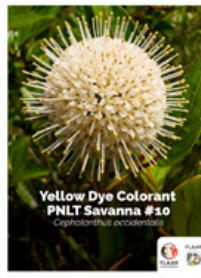
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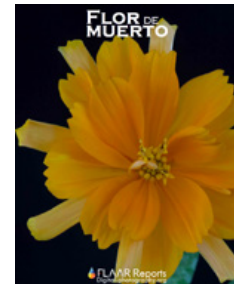
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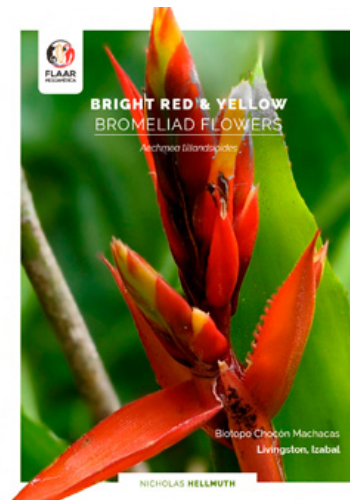
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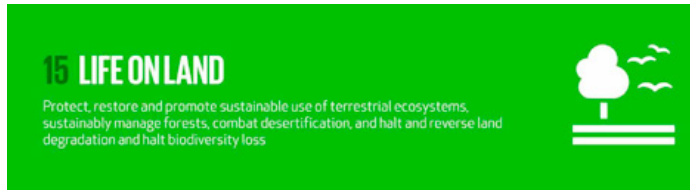


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The current Alcalde of Livingston, Mr. Daniel Pinto, together with his team on the Division of International Cooperation, has set the goal of achieving the municipality development in the years 2020-2024 based on the goals and indicators proposed by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

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

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

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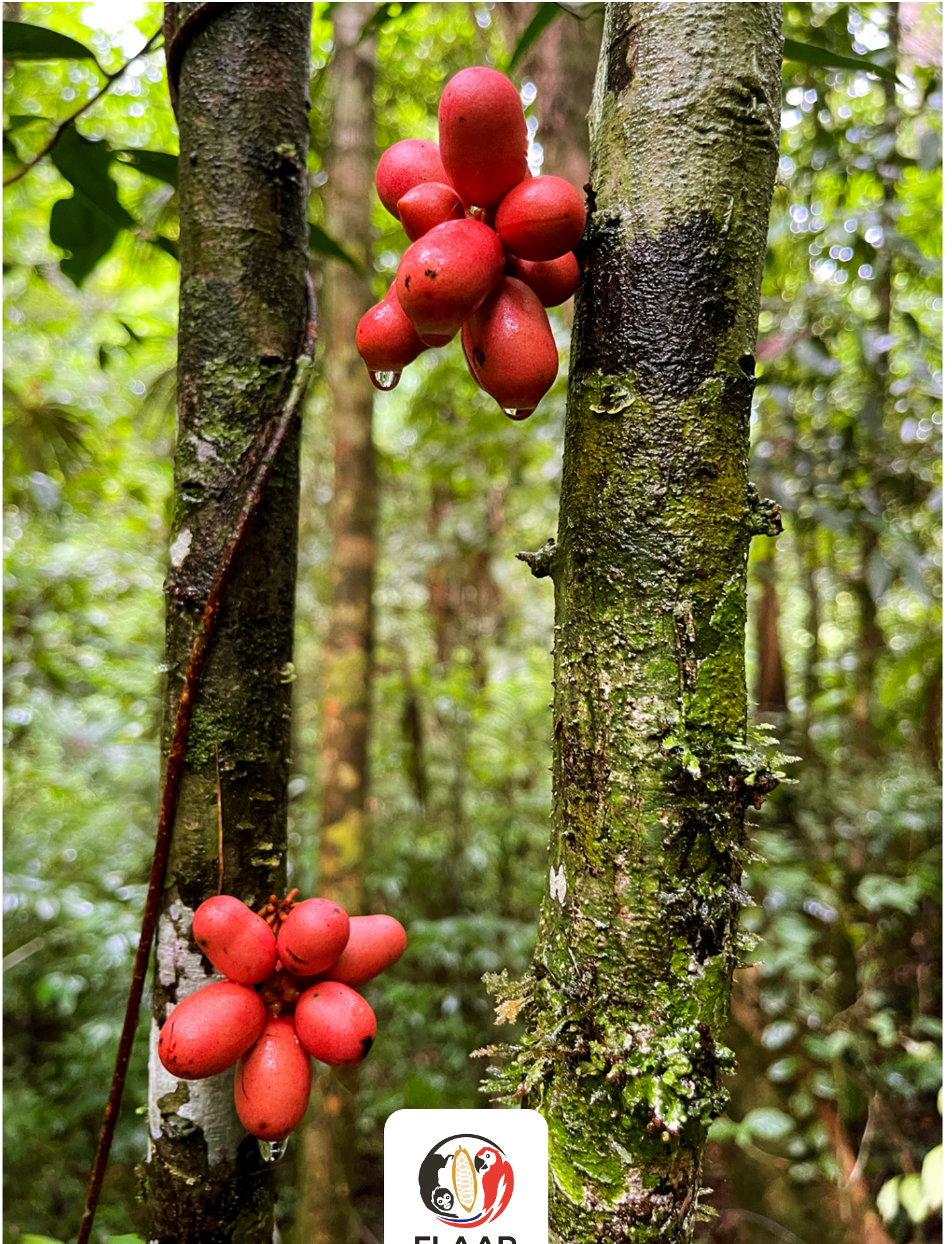
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