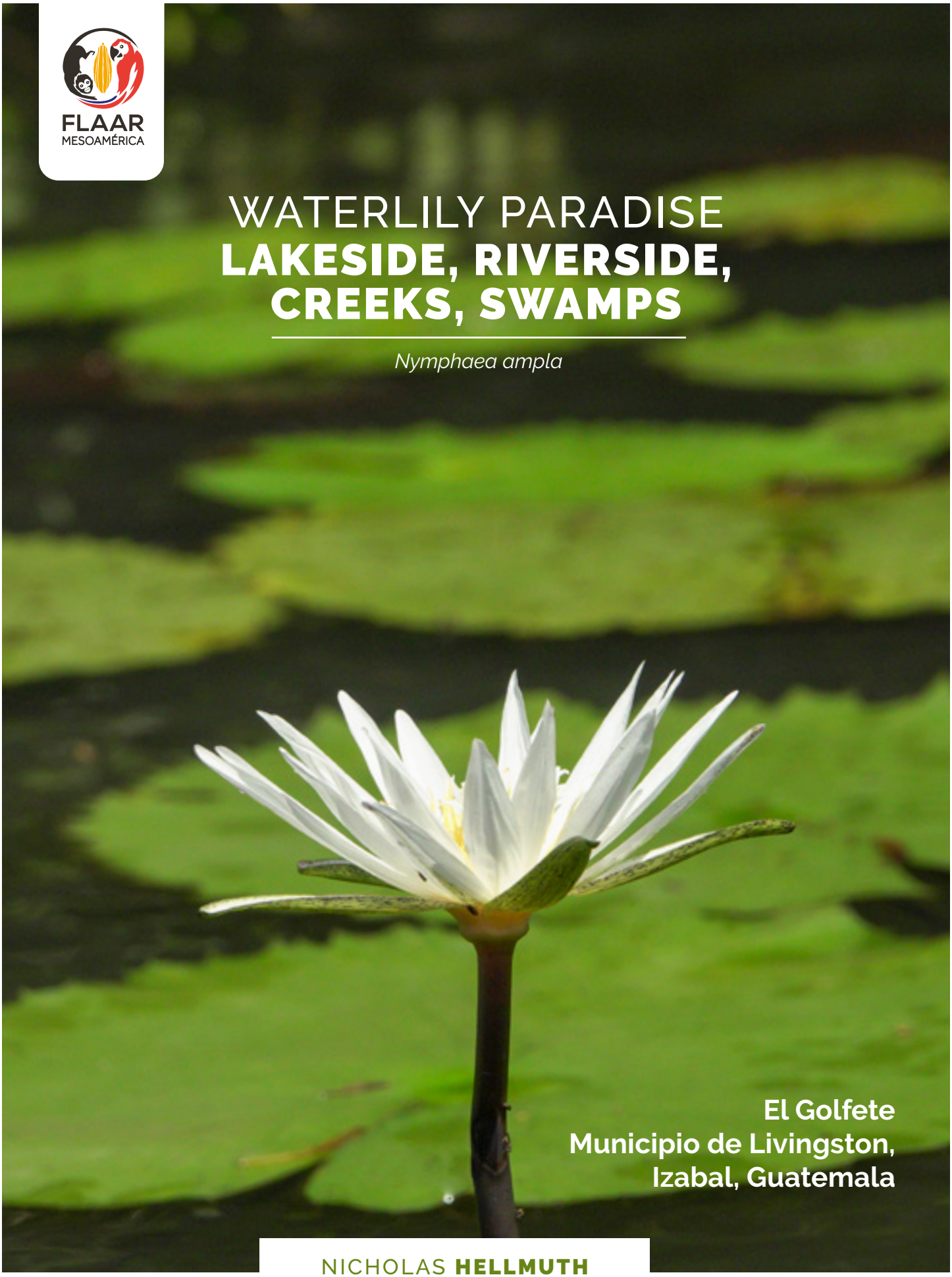
FLAAR
MESOAMÉRICA

WATERLILY PARADISE
LAKESIDE, RIVERSIDE, CREEKS, SWAMPS

Nymphaea ampla

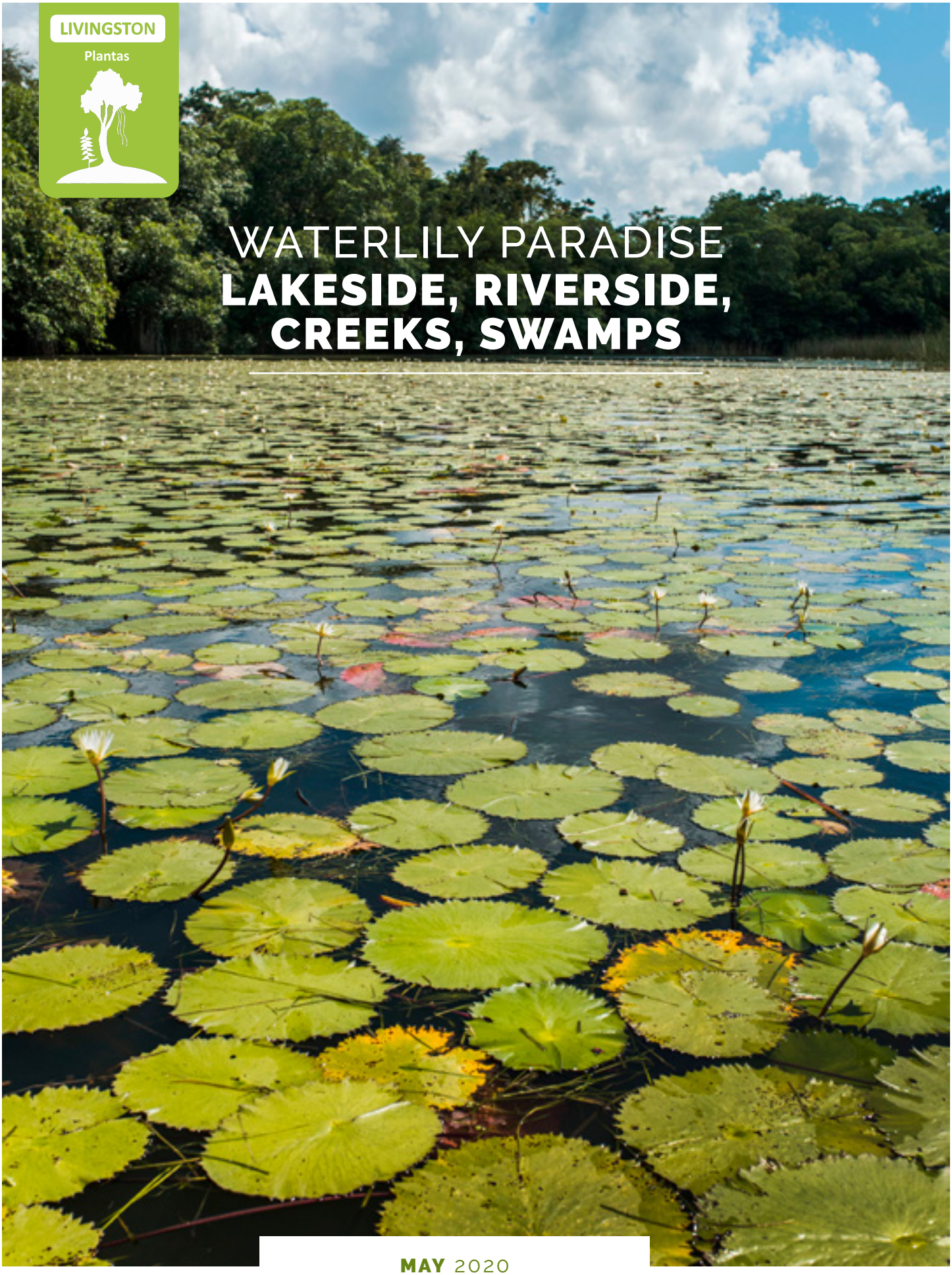


El Golfete
Municipio de Livingston,
Izabal, Guatemala

NICHOLAS **HELLMUTH**

LIVINGSTON
Plantas

WATERLILY PARADISE
LAKESIDE, RIVERSIDE, CREEKS, SWAMPS



MAY 2020

APPRECIATION

Assistance for local Access, Municipio de Livingston

- Daniel Esaú Pinto Peña, Alcalde of Livingston (Izabal, Guatemala).
- Edwin Mármol Quiñonez, Coordinación de Cooperación de Livingston (Izabal, Guatemala)
- Juana Lourdes Wallace Ramírez, Asistente Administrativo, Coordinación de Cooperación de Livingston

CREDITS

The helpful individuals listed below are all part of the FLAAR Mesoamerica research and field work team. The office research team, webmaster, and web designers are additional individuals in the main office in Guatemala City. Since each report is a different plant or animal, the individuals who assist in preparing the bibliography, in species identification and botanical information category are not the same for each report.

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Front Cover Photograph
Nymphaea ampla.
Photograph by: María Alejandra Gutierrez. FLAAR Mesoamerica. March, 14, 2020. El Golfete, Livingston. Camera: SONY DSC-RX10M4. Lens: Sony FE 200-600mm G OSS. Settings: 1/6400, f/4, ISO.500.

Tittle Page Photograph
Nymphaea ampla
Photograph by: María Alejandra Gutierrez. FLAAR Mesoamerica. March, 14, 2020. El Golfete, Livingston. Camera: SONY DSC-RX10M4. Lens:Sony FE 200-600mm G OSS. Settings: 1/6400, f/4, ISO.500.

CONTENTS

FLAAR MESOAMÉRICA

INTRODUCTION TO WATERLILY FIELDS, EL GOLFETE, **RIO DULCE, MUNICIPIO DE LIVINGSTON, IZABAL**

Two species of waterlilies await you in the rivers, creeks, lakes, lagoons, and reed marsh areas of the Municipio de Livingston. There is a large white-water lily flower: *Nymphaea ampla*. And often nearby there is a tiny white flowered water lily, *Nymphoides indica.* For the second one, the edges of its petals are fuzzy and furry.

I have studied waterlily flowers for several decades because my PhD dissertation was on flora and fauna pictured in Classic Maya art related to rivers, lakes, cave streams, and Caribbean reefs (Hellmuth 1987). The iconography and cosmology of *Nymphaea* species of waterlilies is in the dissertation and the subsequent coffee table edition. The botanical aspects of large white waterlilies of Chiapas, Tabasco, Campeche, Belize, Peten, and Monterrico area (inland wetlands parallel to the Pacific Ocean coast of Guatemala) are in a separate FLAAR report that should be finished by late April or May.

Nymphaea ampla. Waterlily founded at the riverside Photograph by: María Alejandra Gutiérrez, FLAAR Mesoamerica. March 14, 2020. Camera: SONY DSC-RX10M4. Lens: 8.8-220mm f/2.4-4. Settings: 1/1600, f/8, ISO.500.

Nymphoides indica. Waterlily founded at the riverside.Photograph by: María Alejandra Gutiérrez, FLAAR Mesoamerica. March 14, 2020. Camera: SONY a7R IV. Lens: Sony 90mm Macro G OSS. Settings: 1/250, f/13, ISO.3200.

The present report is a photo essay on the larger of the two species of waterlilies of the east half of El Golfete and the nature reserves on the west side of Amatique Bay on Izabal. These are the areas we visited in mid-March 2020. So we are looking forward to visiting the entire western part of El Golfete, and the east end of Lake Izabal. One aspect of our multi-faceted project is to locate, identify, photograph at high resolution, and issue reports on as much of the flora and fauna of the Municipio de Livingston as is realistic.

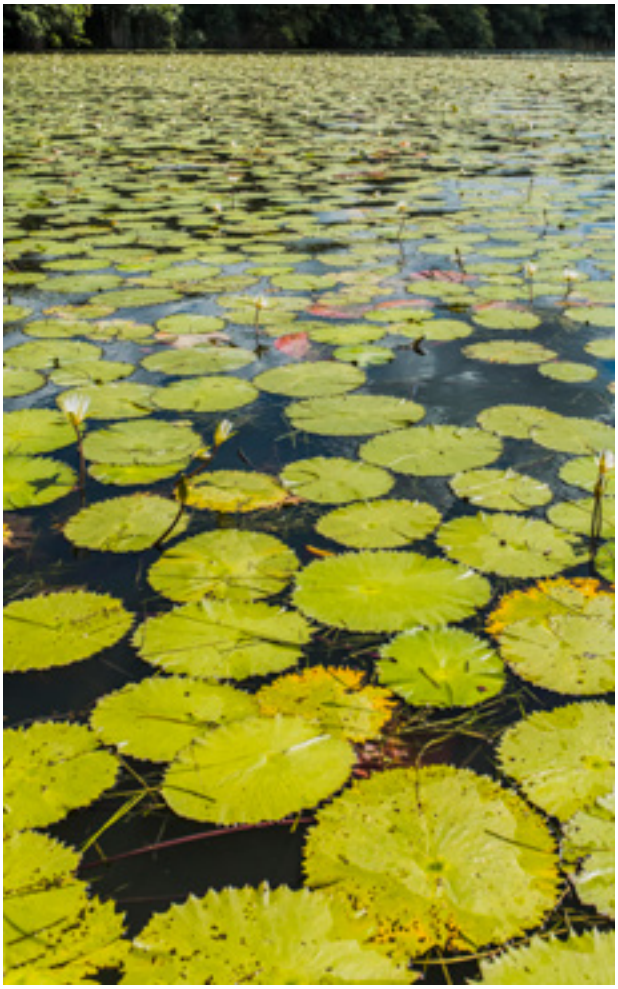
Captions for photographs in the next page:

Photograph #1:
Nymphaea ampla. El Golfete, Livingston. Photograph by: María Alejandra Gutierrez, FLAAR Mesoamerica. March 14, 2020. Camera: SONY DSC-RX10M4 Lens:8.8-220mm f/2.4-4.
Settings: 1/3200, f/4, ISO.500.

Photograph #2:
Nymphoides indica. El Golfete, Livingston. Photograph by: María Alejandra Gutierrez, FLAAR Mesoamerica. March 14, 2020. Camera: SONY a7R IV Lens: Sony 90mm Macro G OSS.
Settings: 1/250, f/13, ISO.3200.

Photograph #3:
Nymphaea ampla. El Golfete, Livingston. Photograph by: David Arrivillaga, FLAAR Mesoamerica. March 14, 2020. Camera: NIKON D5. Lens: Nikon 28-300mm VR.
Settings: 1/1000, f/10, ISO.640.

Photograph #4:
Nymphoides indica. El Golfete, Livingston. Photograph by: María Alejandra Gutierrez, FLAAR Mesoamerica. March 14, 2020. Camera: SONY a7R IV. Lens: Sony 90mm Macro G OSS.
Settings: 1/250, f/13, ISO.3200.

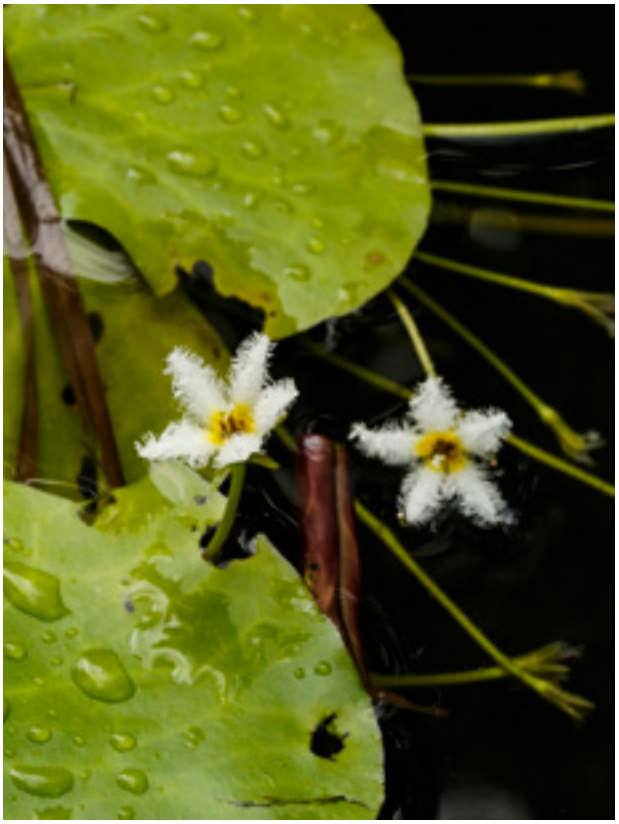


Nymphaea ampla. El Golfete, Livingston. Photograph by: David Arrivillaga FLAAR Mesoamerica. March 14, 2020. Camera: NIKON D5. Lens: Nikon 28-300mm VR. Settings: 1/320, f/13, ISO.500.

Photograph #1

Photograph #2

Photograph #3



Photograph #4

WHERE AND HOW TO FIND **THE LARGE WATERLILY FLOWERS IN IZABAL?**

The best way to experience the waterlily "fields" is to find a boat capitan and guia who know the rivers, creeks, and inlets on both the north and south sides along El Golfete. If you take a rapid boat shuttle from Rio Dulce town to Livingston town, you will see hundreds of brown pelicans, hundreds of great white herons, and lots of other waterbirds. You will see lush tropical rain forest, especially in the Rio Dulce Canyon. But to experience the waterlilies it helps to have a boat that is not moving at high speed and to have a boat capitan that knows what flora and fauna you would like to learn about. And most important, that you set aside time to enter the inlets and coves and creeks and lagoons.

We were fortunate that one of our boat captains sensed that I enjoyed getting into the less often visited inlets and lagoons far inland from the center of the El Golfete. So he took us into areas that I had never before experienced in my visits to Izabal in past decades.

Nymphaea ampla. El Golfete, Livingston.
Photograph by: David Arrivillaga FLAAR Mesoamerica. March 14, 2020. Camera: NIKON D5. Lens: Nikon 28-300mm VR. Settings: 1/320, f/13, ISO.500.

In following days, the other boat captains also noticed that I preferred to be as far north and as far south as possible from the center of El Golfete. We will need to make our own map in the future because no map shows names for all the inlets or creeks or even all the rivers. Google maps, in satellite view shows the actual waterlily field, but does not name most of the inlets nor creeks. Not even Lagunita Creek is listed near the mouth of the Rio Sarstun (the border of Peten and Belize). INGUAT has two colorful maps: one of Livingston; another of Rio Dulce.

But again, neither lists the name of every lagoon, every inlet, or every creek. So as soon as the Coronavirus shutdown is over, we will obtain aerial photographs and detailed printed maps of the 1:50,000 series of IGN, and from these will make our own maps. The goal of these new maps is to assist people around the world in planning their visit to the Municipio de Livingston. If you are a botanist or ecologist, or a student looking for a place to do your thesis or dissertation field work, we also want to have these maps available for you.

Nymphaea ampla. El Golfete, Livingston.
Photograph by: María Alejandra Gutiérrez, FLAAR Mesoamerica. March 14, 2020. Camera: SONY DSC-RX10M4. Lens: 8.8-220mm f/2.4-4. Settings: 1/3200, f/4, ISO.500.

Nymphaea ampla. El Golfete, Livingston.
Photograph by: Nicholas Hellmuth, FLAAR Mesoamerica. March 14, 2020. Camera: NIKON D810.
Lens: Nikon AF-Micro-NIKKOR 200mm f/4D IF-ED Macro. Settings: 1/320, f/13, ISO.800.

NYMPHAEA IN FRONT OF ECO-ALBERGUE **LAGUNITA CREEK NATURE RESERVE**

The Área de Usos Múltiples Río Sarstún, Municipio de Livingston, Izabal, Guatemala has areas of water plants along the shore. These are not visible from Google maps satellite view because the trees lean over the edge of the rivers and creeks (so you can't see the waterlilies next to the shore).

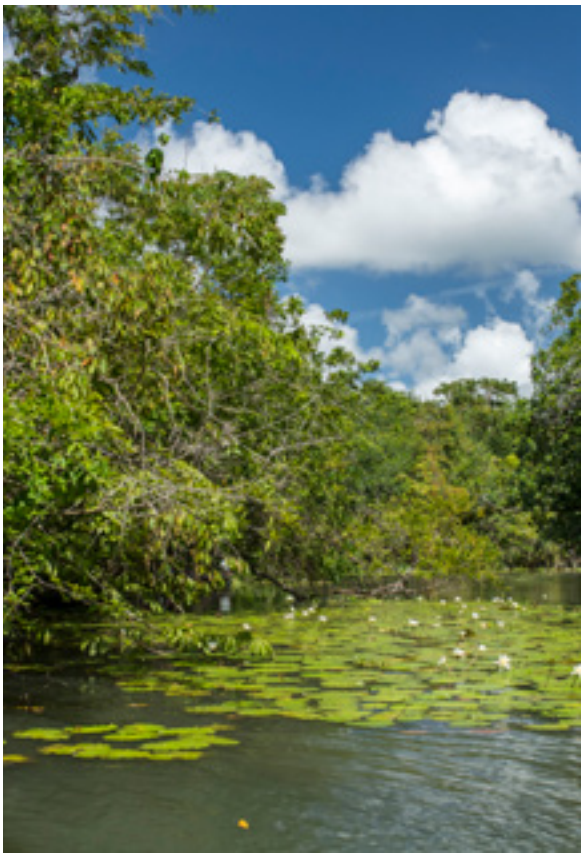
Nymphaea ampla waterlilies, In front of Acoelorrhaphe wrightii palm on shore in Lagunita Creek, Municipio de Livingston Izabal, Guatemala. The large leaves in the center and left we estimate are from Pachira aquatica, zapoton, pumpo, a tree that likes to grow directly adjcent to rivers and lakes.
Photograph by: Nicholas Hellmuth,FLAAR Mesoamerica. March 12, 2020. Camera: Google Pixel 3XL .

***Nymphaea ampla* waterlilies.** *Acoelorrhaphe wrightii* on shore Lagunita Creek, Livingston In the middle you see the common riverside palmetto palm, most likely *Acoelorrhaphe wrightii*. To the immediate right side that tree may be a *Pachira aquatica* (a tree that likes even more than the palm to be physically adjacent to a riverside or lakeside. This is the same photograph as on the previous page, but on the present page we show the entire landscape view. The river height of the shore vegetation, and the rather steep hills in the background. The Municipio of Livingston has lots of biodiversity. Photograph by: Nicholas Hellmuth,FLAAR Mesoamerica. March 12, 2020. 7:20 am in the morning.Camera: Google Pixel.

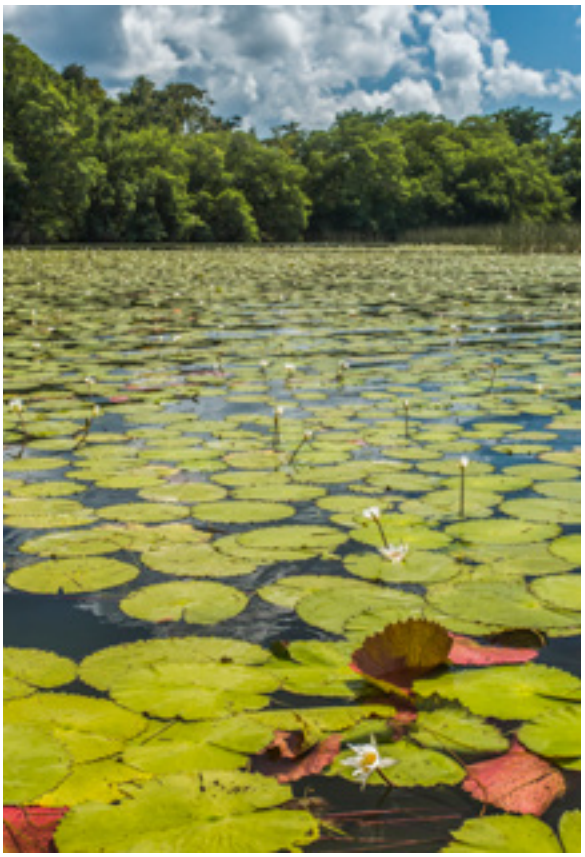
ANNUAL VARIATION **OF WATER LEVEL**

Water levels of rivers and lakes in most parts of Central America vary by time of the year: rainy season or dry season. And near the Caribbean Sea the amount of water flowing eastward controls to some degree the amount of sea water that may come in from the nearby Caribbean. For example, we have spoken with local people who know that the bull shark (Carcharhinus leucas) comes all the way into the Golfete in some years (usually Easter Week, Semana Santa) but this depends on whether it's a rainy year or a dry year. In past decades the bull shark could get all the way into Lake Izabal (on the west side of the highway bridge). But nowadays with all the boats everywhere, not as much bull sharks make this journey.

This is the same species of shark that inhabits fresh water areas of Nicaragua. It also comes upstream in rivers in Tabasco, Mexico.



Nymphaea ampla. El Golfete, Livingston Photograph by: David Arrivillaga FLAAR Mesoamerica. March 14, 2020. Camera: NIKON D5. Lens: Nikon 28-300mm VR. Settings: 1/1000, f/5,6, ISO.640.



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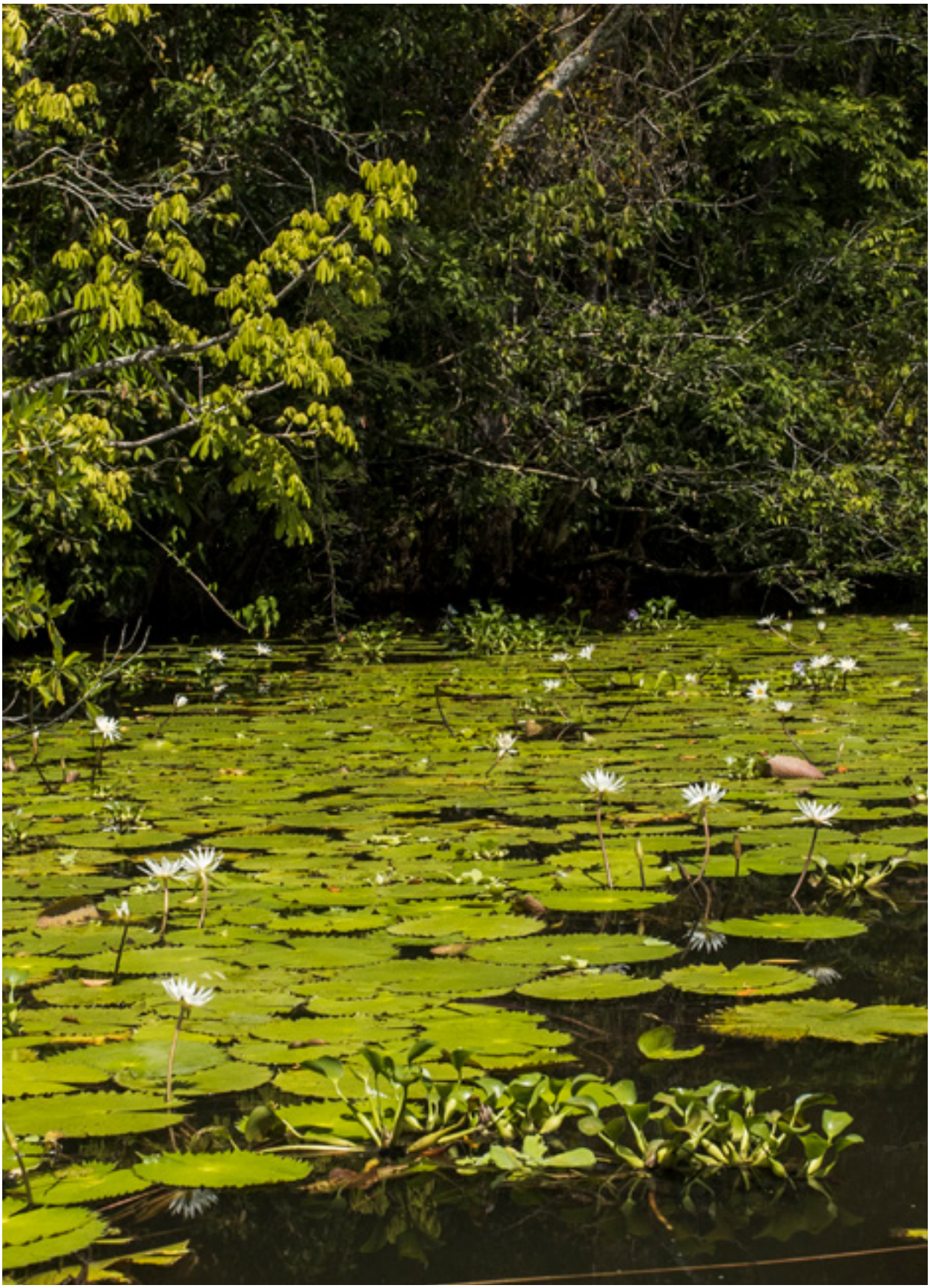

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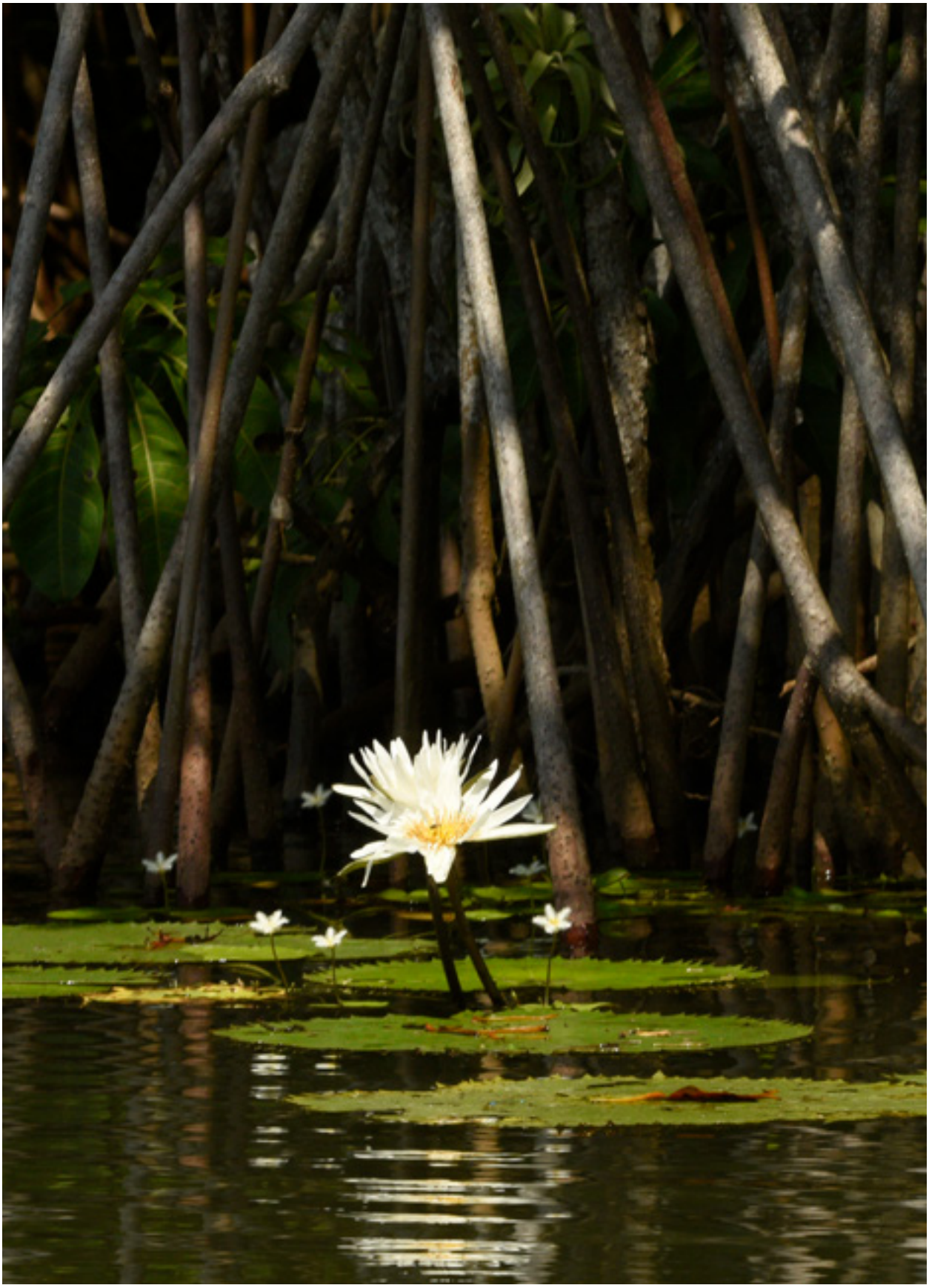
Lens: Nikon AF-Micro-NIKKOR 200mm f/4D IF-ED Macro. Settings: 1/320, f/13, ISO.800.

¡!

Linguists estimate that the modern English word shark may have come from an earlier English word shark that was derived from their early attempt to pronounce the Mayan word for shark, which is xoc. Sharks are pictured in Classic Maya art and their teeth were used as decoration (and shown as "fangs" in Classic Maya art). However other historians document that the early English had the word shark already by the 15th century (before pirates learned about xoc of the Maya). So the similarity in pronunciation xooc and shark may be coincidence.

Zoologists are aware that the bull shark swims upriver in Tabasco into the Rio Usumacinta and swims into El Goftete, Rio Dulce and Lake Izabal and swims into other rivers elsewhere in Mexico and Central America (Jones 1985, Thorson et al. 1966, Sosa et al. 1998, Castro 2002, Newman 2016)

Nymphaea ampla. El Golfete, Livingston.
Photograph by: María Alejandra Gutiérrez, FLAAR Mesoamerica. March 14, 2020. Camera: SONY a7R IV. Lens: Sony 90mm Macro G OSS. Settings: 1/400, f/22, ISO.3200.



Nymphaea ampla with ***Nymphoides indica*** at the back. El Golfete, Livingston.
Photograph by: Nicholas Hellmuth, FLAAR Mesoamerica. March 14, 2020. Camera: NIKON D810. Lens: Nikon AF-Micro-NIKKOR 200mm f/4D IF-ED Macro. Settings: 1/320, f/13, ISO.800.

Nymphaea ampla survives brackish water in Izabal as well as brackish water inland in lagoon, reed marshes and mangrove areas parallel to the Pacific Ocean. And this waterlily also grows in clearwater streams such as Arroyo Pucte (a tributary of Rio la Pasion, in Peten). So *Nymphaea* waterlily species are adaptable.

They can also grow in relatively shallow mud flats, along shallow edges of rivers, creeks and lagoons. But thousands of these *Nymphaea* waterlily plants grow in the fast flowing Arroyo Pucte which is pristine crystal clear two or three meters deep (I have done field work there including spending literally days camped on the edge of this river several times a year).

In the Municipio de Livingston most of the area has a sediment base from soil washed down from the hills over the centuries and brought in from the Rio Polochic and other tributaries. We will look forward to make a list of the kinds of habitats where *Nymphaea* grows in El Golfete area, but most of the shore is mangrove swamp.

To show the world the awesome beauty of the waterlily areas of the Municipio de Livingston it would be helpful to use an experienced drone pilot. You obviously need to use the drone in areas with no birds and at an hour that the drone can best be flown. Naturally (and correctly) it is not legal to use a drone in any national park. But to provide material for botanists, ecologists, tour organizers, etc. it would help if just one time an experienced drone pilot could be brought in. FLAAR Mesoamerica has a good drone photography system and a licensed experienced drone pilot has worked with us twice in areas not far from Arroyo Petexbatun in Peten.

Waterlilies.On this photograph we can see at the front (little white spots near the mirror water) ***Nymphoides indica*** and at the back (bigger flowers floating up the water) ***Nymphaea ampla*** at Lagunita El Salvador. Photograph by: David Arrivillaga FLAAR Mesoamerica. March 14, 2020. Camera: SONY a7R IV. Lens: Sony 90mm Macro G OSS. Settings: 1/1600, f/13, ISO.3200.

SATELLITE VIEW, GOOGLE MAPS, IS EASIEST WAY **TO SEE THE WATERLILY AREAS**

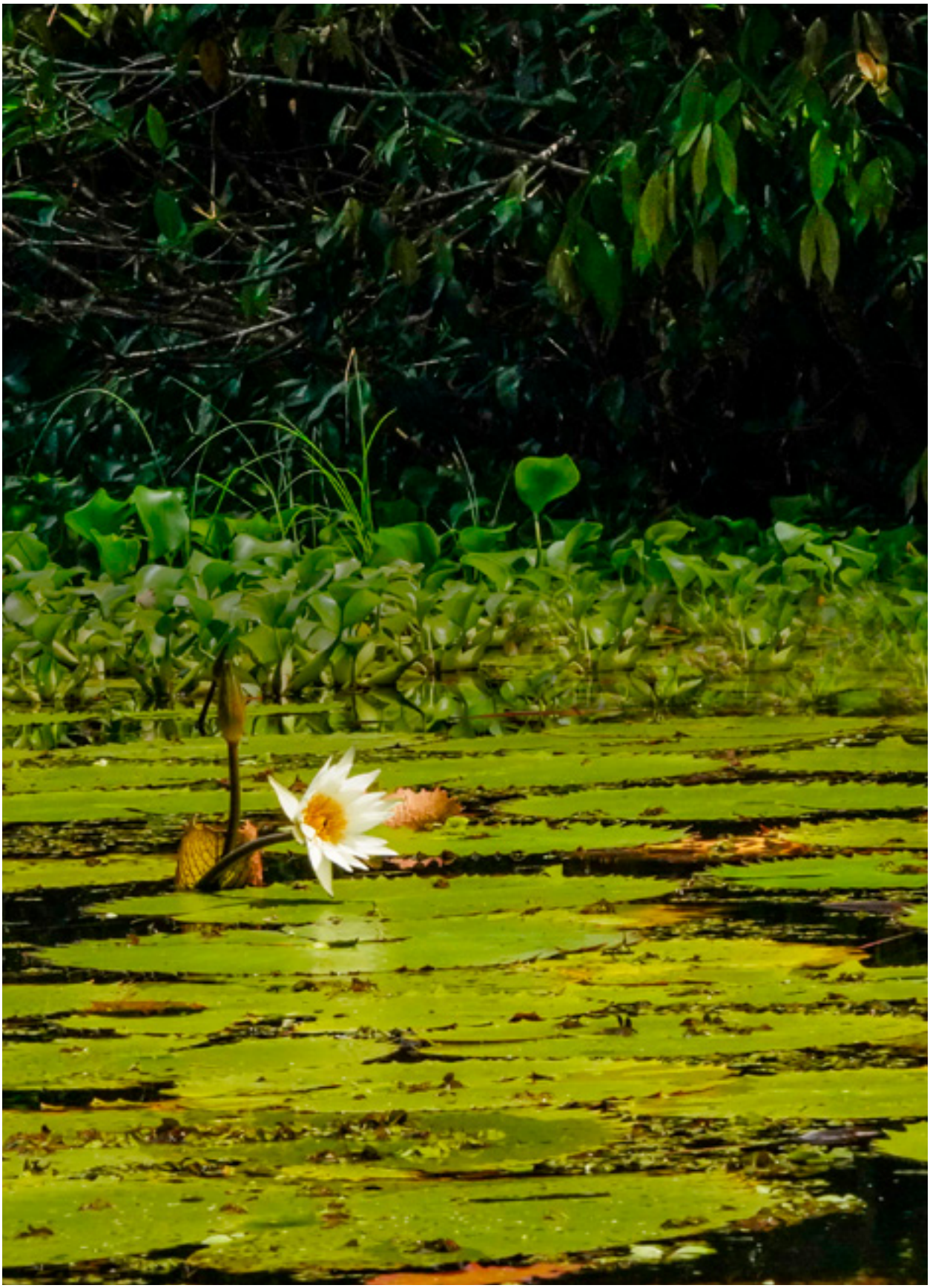
Because every year the water is slightly different level and different salinity, and as in some years there is more pollution (pesticides and herbicides from commercial plantations along Rio Polochic), the areas with, or areas without, waterlilies may vary.

The aerial photographs of IGN are circa 2005 or 2006. Google satellite view is obviously more recent, and since I don't yet have the IGN aerial maps, I use here the Google satellite views). If you Google "El Golfete aerial photographs" you get

> Photos of the highway bridge from the air
> Photos of Lake Izabal from the air (but not El Golfete which is several kilometers east)
> Tons of photos of Castillo de San Felipe
> Photos of hotel docks
> Photos of hotel swimming pools
> ZERO photos of waterlily ecosystems.

This embarrassing lack of aerial views of waterlily areas is another reason why a one-time drone aerial photography permit would help of both the north and south sides of El Golfete (all the inlets, creeks, rivers, lagoons, and reed marsh areas). The number of botanists, ecologists, students, and interested public would definitely increase (which provides jobs for the people of the Municipio de Livingston).

Nymphaea ampla. El Golfete, Livingston
Photograph by: David Arrivillaga FLAAR Mesoamerica. March 14, 2020. Camera: NIKON D5. Lens: 35mm f/1.4. Settings: 1/640, f/8, ISO.640.



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RIO SARSTUN AND **LAGUNITA CREEK AREAS**

Google maps, satellite view, for the entire Rio Sarstun area is so dark it is useless. Lagunita Creek is not identified nor is the CONAP-FUNDAECO nature reserve. Laguna Grande looks like an interesting area but Google maps is so dark and all you can see is reflection of the clouds, so you can't see the vegetation in or around Laguna Grande.

Along the coast of Amatique Bay, close to zilch on Google maps. Tapon Creek nature reserve (CECON-USAC) is on the map if you know where to look for it. But Tapon Creek itself is identified. But the other creek a kilometer or so to the south is not named whatsoever. Google prefers to list primarily commercial locations (hotels, restaurants, etc.).

Screenshot, Taken from Google Earth on April 13th, 2020. This unnamed creek south of Tapon Creek has awesome flat muddy-looking delta area. I bet this is a wetlands paradise, that we should certainly study and photograph on a future field trip.

Screenshot, Taken from Google Earth on April 13th, 2020. Many kilometers closer to Livingston there is Rio Quehueche. We have not yet had time to enter this river to search for waterlilies and other interesting plants.

NYMPHAEA SP. IN EL GOLFETE, PLUS INLETS AND **LAGOONS NORTH AND SOUTH**

This is the area of the Municipio we had planned for our April field trip, but with the pandemic around the world in late March and early April, we are obviously not doing field trips in April. But definitely this is a crucial place to explore, photograph, document, and publish.

Screenshot, Taken from Google Earth on April 13th, 2020.
At the far west end of El Golfete, there is this wedge-shaped island with thousands of *Nymphaea* along 80% of the north side and 40% of the south side. The Nymphaea "fields" are quite extensive, potentially the largest in the Municipio de Livingston

Screenshot, Taken from Google Earth on April 13th, 2020.

I try to show two views of each area: a close-up so you can see the waterlily fields. And a wider picture to show where this is in El Golfete. We would appreciate when readers could let us know where we can find higher resolution photos than these of Google maps. But to start with these Google satellite views are “better than nothing.”

Google maps shows two different rivers with the name Rio Chocon Machacas: the northern one comes from Lagunita Calix and nearby Lagunita Salvador. The other longer one enters much further to the south, at the area with so many waterlilies that it is named Golfete De Los Lirios (but along the same northern coast of El Golfete).

Screenshot, Taken from Google Earth on April 13th, 2020.

Screenshot, Taken from Google Earth on April 13th, 2020.
There are two inlets or lagunitas on the north side of where Rio Chocon Machacas enters El Golfete. Lots of waterlilies around the outside edges here.

Then every hundred meters there are narrower but still satellite-visible bands of waterlilies (but not visible in copy-and-paste images; you need to have the original Google satellite view on your own high-res computer monitor directly from Google).

When you enter most creeks, lagoons, etc. you will find small areas of waterlilies along the banks. Sometimes flat areas with reeds standing out from the shallow water have a few waterlilies among the reeds. These are near the entrance to the dock at the Biotopo Chocón Machacas. But these are not visible from Google maps satellite view. Note:

Screenshot, Taken from Google Earth on April 13th, 2020.

Screenshot, Taken from Google Earth on April 13th, 2020.

Screenshot, Taken from Google Earth on April 13th, 2020.
The third awesome "fields" of waterlilies, so many square meters and so thick that it is visible from satellites, is at the immediate south where the wider El Golfete narrows to start the Rio Dulce Canyon.

MUNICIPALIDAD DE
Livingston

ACKNOWLEDGMENTS FOR LIVINGSTON

We thank Ing. Daniel Esaú Pinto Peña Livingston mayor (Izabal, Guatemala) for the cooperation provided by him and the team of the Municipio de Livingston. Also thank him for accompanying us to Nito Maya during our first field trip and has kindly made time to visit with our team on each of the initial field trips.

We thank Edwin Mármol Quiñonez, Coordinación de Cooperación de Livingston (Izabal, Guatemala), and his son Leonel. He kindly accompanied us every day of the first field trip to the Municipio of Livingston.

We appreciate the cooperation of Juana Lourdes Wallace Ramírez, Asistente Administrativo, Coordinación de Cooperación de Livingston, for organizing the day-by-day transportation and logistics for our team. Lourdes also accompanies us each day of each field trip, including long hikes and deep into caves.

The local guides, the boat captain and boat assistants, the local drivers are helpful because they know the local area. We appreciate that they share their experiences with us; in return we also mention to them the aspects of the different plants that we find on the shore or along the trails.

We will donate all photographs that we take in the Municipio of Livingston to the Municipio. These can be used by the Municipio at no fee; credit to the individual photographer and to FLAAR Mesoamerica is appreciated when an image is used.

FLAAR
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ACKNOWLEDGEMENTS TO FLAAR MESOAMÉRICA

The reports are a joint production between the field trip team and the in-house office team. So here we wish to cite the full team:

Flor de Maria Setina is the office manager, overseeing all the diverse projects around the world (since FLAAR-REPORTS research on advanced wide-format digital inkjet printers is a worldwide project for over 20 years. We also utilize the inkjet prints to produce educational banners to donate to schools. On a banner we can show an entire ecosystem at a size even larger than in a coffee table art book.

Vivian Díaz is project manager for flora, fauna projects (field work and resulting reports at a level helpful for botanists, zoologists and ecologists, and for university students). We then utilize our experience to also produce books on ecological rescue concepts for educational projects in local schools in remote areas of Guatemala.

Victor Mendoza identifies plants, mushrooms, lichen, insects, and arachnids. When his university schedule allows, he also likes to participate in field trips on flora and fauna research.

Vivian Hurtado prepares the bibliography for each subject and downloads pertinent research material for our e-library on flora and fauna. All of us use both these downloads plus our in-house library on flora and fauna of Mesoamerica (Mexico through Guatemala into Costa Rica).

Andrea Sánchez is a designer who helps prepare the master-plan for aspects of our publications.

Ximena Arriaga is a designer who puts together the text and photographs to create the actual report.

Jaqueline Gonzalez is a designer who puts together the text and photographs to create the actual report (we have several designers at work since we have multiple reports to produce).

Maria Alejandra Gutierrez is an experienced photographer, especially with the Canon EOS 1D X Mark II camera and 5x macro lens for photographing tiny insects, tiny flowers, and tiny mushrooms. Work during and after a field trip also includes sorting, naming, and processing. And then preparing reports in PDF format.

David Arrivillaga is an experienced photographer and is able to handle both Nikon and the newest Sony digital cameras. Work during and after a field trip also includes sorting, naming, and processing. And then preparing reports in PDF format.

Roxana Leal is Social Media Manager for flora and fauna research and publications, and MayanToons educational book projects

Juan Carlos Hernandez takes the material that we write and places it into the pertinent modern Internet software to produce our web pages (total network is read by over half a million people around the world).

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

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

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

Rosa Sequen is also an illustrator for MayanToons and also helps prepare illustrations for Social Media posts and for animated videos.

Laura Morales is preparing animated videos in MayanToons style since animated videos are the best way to help school children how to protect the fragile ecosystems and endangered species

LIVINGSTON: THE CARIBBEAN BIODIVERSITY WONDERLAND OF GUATEMALA

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

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

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

We hope to attract the attention of professors, botanical garden clubs, orchid and bromeliad societies, students, tourists, experts, explorers, photographers and nature lovers who want to get closer, to marvel at the species of flowering plants, mushrooms and lichen that FLAAR Mesoamerica finds during each field trip each month.

MUNICIPALIDAD DE Livingston

FLAAR MESOAMÉRICA

FLAAR MESOAMÉRICA

FLAAR Mesoamerica (Foundation for Latin American Anthropological Research), is a nonprofit Guatemalan institution founded under the direction and enthusiasm of Biologist Eduardo Sacayon and Dr. Nicholas Hellmuth, a specialist of Classic Mayan iconography and architecture who then evolved his research to focus on edible and utilitarian plants, with the aim of wanting to see our country be recognized throughout the world for its biodiversity of plants, cultures, and natural resources. Likewise, our work has arisen from the interest and support of the board directors of FLAAR Mesoamerica, its president, Eduardo Sacayón, its vice president Flor de María Setina, the secretary Rodrigo Girón, the treasurer Oscar Lambourg and his member Elsa Morales.

One of our main objectives at FLAAR Mesoamerica is to increase consciousness about caring and protecting Mesoamerican natural diversity. By utilizing high-resolution photography, we can better showcase the remarkable flora and fauna of Guatemala. These photographs, and the accompanying information, will awake the admiration and desire in those who follow our work. Thus, the FLAAR Mesoamerica teams create educational material about the biodiversity that deserves recognition and protection.

The work done at FLAAR Mesoamerica consists of the methodological compilation of facts about nature, flora, fauna, history, and cultures of Mesoamerica, and disseminate it to the largest audience both in Guatemala and around the world. We also are inspired to provide for all our readers plenty of annotated suggestions of lots of other reports, articles, thesis, dissertations, and web sites via our bibliographies of suggested additional reading. Our focus is generate materials that are easy to read, educational, reliable, and visually pleasing by using lots of full-color photographs -just like this report!

We also prepare illustrated books and animations for primary school children and Mayan families in Guatemala to have access to information about the need to protect the fragile ecosystems and flora and fauna throughout this Central American republic.

We are open to work with, share, and, expand our accomplishments with other organizations, institutions, or companies that share our vision.

You can find more of our work throughout the different digital platforms of our directory:

www.FLAAR-mesoamerica.org
www.digital-photography.org
www.maya-ethnozoology.org
www.maya-ethnobotany.org

FLAAR_mesoamerica@flaar.org

REFERENCES CITED ON *NYMPHAEA AMPLA* **AND SUGGESTED ADDITIONAL READING**

A separate bibliography on the bull shark in Rio Dulce is after this introductory bibliography on waterlily flowers. The complete bibliography for Nymphaea is in the separate report on waterlilies of Guatemala in general (Livingston area, Peten, Monterrico area, etc.).

BARBOSA, Bonilla Jaime

2008 Taxonomy and typification of Nymphaea ampla (Salisb.) DC. Sensu lato Nymphaea.

CANO, Mirtha and Nicholas HELLMUTH

2008 Sacred Maya Flower, Nymphaea ampla Salisb. Asociacion FLAAR Mesoamerica. Guatemala.

Free download on www.maya-ethnobotany.org or elsewhere.

HELLMUTH, Nicholas M.

1987e The Surface of the Underwaterworld Iconography of the Gods of Early Classic Maya art in Peten, Guatemala. revised English original of PhD. Dissertation (submitted and accepted 1986). Vol. 1, 306 pages (text). Vol. 2, 255 pages (about 199 pages of line drawings, more than half done specifically for this PhD dissertation).

I call this "e" because it is English. I call the other edition "d" for Deutsch. I sincerely appreciate Suzanna Reisinger, my helpful trilingual and multi-cultural Swiss-Austrian (Liechtenstein) girlfriend for translating the zillion pages of my dissertation into German.

HELLMUTH, Nicholas M.

1987d Monster und Menschen in der Maya-Kunst. 2000 Jahre Kultur aus dem tropischen Urwald. Akademische Druck u. Verlagsanstalt, ADEVA, Graz, Austria. 403 pages 727 illustrations.

This is the coffee table book edition of the PhD dissertation a year earlier at Karl-Franzens Universitaet, Graz, Austria.

STANDLEY, Paul C. and Julian A. STEYERMARK

1946 Flora of Guatemala. Fieldiana, Botany, Volume 24, Part IV.

RANDS, Robert L.

1953 The Water Lily in Maya Art: A Complex of Alleged Asiatic Origin. Bureau of American Ethnology Bulletin 151:75–153.

I met Dr Rands several times; a pleasant and capable scholar. However I am not a believer in pre-Columbian symbolism being derived from other continents. But, that said, why are the Veracruz kings bearded; and why are Cotzumalhuapa royal heads in 3-dimensional life-size stone sculptures the size and shape of what I would expect for Etruscan or other European individuals? Veracruz is on the Atlantic Coast of Mexico. Cotzumalhuapa is inland from the Pacific Coast of Guatemala.

Free download:
https://repository.si.edu/bitstream/handle/10088/22076/bae_bulletin_151_1953_34_75-153.pdf?sequence=1&isAllowed=y

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.

http://legacy.tropicos.org/NameSearch.aspx?projectid=3
This is the main SEARCH page.

http://enciclovida.mx
CONABIO. The video they show on their home page shows a wide range of flowers pollinators, a snake and animals. The videos of the insects are great.

www.kew.org/science/tropamerica/imagedatabase/index.html
Kew gardens in the UK is one of several botanical gardens that I have visited (also New York Botanical Gardens and Missouri Botanical Gardens (MOBOT), in St Louis. Also the botanical garden in Singapore and El Jardín Botánico, the open forest botanical garden in Guatemala City).

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

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 SITES ON WATERLILIES OR **SPECIFICALLY ON *NYMPHAEA AMPLA***

www.backyardnature.net/yucatan/dotleaf.htm
As usual, nice photos and helpful info. Also mentions his work together with FLAAR in the 1970's.

www.cicy.mx/sitios/flora%20digital/ficha_virtual.php?especie=687
Information.

www.iwgs.org
International Waterlily and Water Gardening Society. I do not know them, but would like to learn more about them.

www.naturalista.mx/taxa/165750-Nymphaea-ampla
Photos and map of distribution.

REFERENCES CITED ON BULL SHARK **FAR INLAND FROM THE SEA**

CASTRO, J. I.

2002 On the origins of the Spanish word 'tiburón', and the English word 'shark.' Environmental Biology of Fishes 65: 249–53.

JONES, Tom

1985 The Xoc, the Sharke, and the Sea Dogs: An Historical Encounter. in "Fifth Palenque Round Table, 1983," edited by Virginia M. Field, Volume VII: 211-222. Pre-Columbian Art Research Institute

Free download:
www.mesoweb.com/pari/publications/RT07/Xoc.pdf

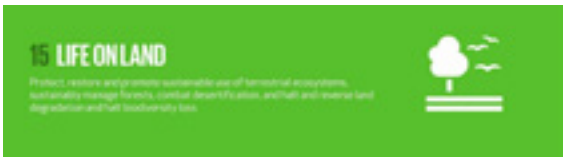
NEWMAN, Sarah

2016 Sharks in the jungle: real and imagined sea monsters of the Maya. Antiquity, Volume 90, Issue 354, pp. 1522-1536.

SOSA Nishizaki, Oscar, TANIUCHI, Toru, ISHIHARA, Hajime and Makato SHIMIZU

1946 El tiburón chato, Cudzarhinus feucas (valenciennes, 1841), del río Usumacinta, Tabasco, México, con notas sobre la composición de su suero sanguíneo y osmolaridad. Ciencias Marinas, vol. 24, núm. 2, junio, 1998, pp. 183-192. Universidad Autónoma de Baja California Ensenada, México.
English on one side of the page (Bull Shark); Spanish on the other.

Free download:
www.redalyc.org/pdf/480/48024204.pdf



The current Alcalde of Livingston, Mr. Daniel Pinto, together with his team of International Cooperation division, Mr. Edwin Mármol, have set the goal of achieving the municipality development in the years 2020-2024 based on the goals and indicators proposed by the 2030 Agenda for Sustainable Development. From this agenda, FLAAR Mesoamerica will collaborate to achieve Sustainable Development Goal (SDG) number 15 "Life on Land".

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

SERIES OF MUNICIPIO OF LIVINGSTON

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

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

This report may be cited with this information:

Hellmuth, N. (2020) Waterlily Paradise Lakeside, Riverside, Creeks, Swamps, *Nymphaea ampla*, Livingston, Izabal. Guatemala: FLAAR Mesoamerica.

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

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

All national parks, nature reserves, and comparable are welcome to have and use our reports at no cost. USAC, UVG, URL, Universidad Rural, INTECAP and other Guatemalan universities, and high schools, and schools, are welcome to post our reports, at no cost.

If you wish our flora and fauna material as a powerpoint presentation

Dr Nicholas (Hellmuth) is flown all around the world to lecture. He has spoken in Holland, Belgium, Germany, Austria, Greece, Italy, Serbia, Croatia, Bosnia, Russia, UK, Dubai, Abu Dhabi, Thailand, Korea, China, Japan, Canada, USA, Mexico, Panama, Guatemala, etc. He can lecture in Spanish, German, or English (or simultaneously translated to your language). He has lectured at Harvard, Yale, Princeton, UCLA, Berkeley and dozens of other universities, colleges, etc. He has also lectured at Rotary Club events, etc. He also writes cartoon books on plants and animals of Guatemala so gives presentations to kindergartens, primary school, high schools, etc. www.MayanToons.org shows our educational material for children.

If your club, association, institute, botanical, garden, zoo, park, university, etc. Wishes high resolution photos for an exhibit in your facility anywhere in the world

The Missouri Botanical Garden (MOBOT) has had two exhibits of the FLAAR Mesoamerica photos on Neotropical flowering plants of Guatemala. Photos by the FLAAR team have also been exhibited at Photokina in Germany and in Austria, Guatemala, and elsewhere. For use of these photos in a book or exhibit, naturally we need to discuss how to share the costs. We have material for entire exhibits on: Orchids of Guatemala (including aquatic orchids), Dye colorants from Mushrooms and Lichens of Guatemala, Bromeliads of Guatemala, Trees of Guatemala, Treetop Ecosystems of Guatemala (includes arboreal flowering cacti, bromeliads, and orchids), Cacao Cocoa Chocolate and their Maya and Aztec Flavorings. We naturally appreciate a contribution to help cover the costs of our office expenses for all the cataloging, processing, and organization of the photos and the field trip data.

To publish photographs

Hellmuth's photographs have been published by National Geographic, by Hasselblad Magazine, and used as front covers on books on Mayan topics around the world. His photos of cacao (cocoa) are in books on chocolate of the Maya and Aztec both by Dr Michael Coe (all three editions) and another book on chocolate by Japanese specialist in Mayan languages and culture, Dr Yasugi. We naturally appreciate a contribution to help cover the costs of our office expenses for all the cataloging, processing, and organization of the photos and the field trip data.

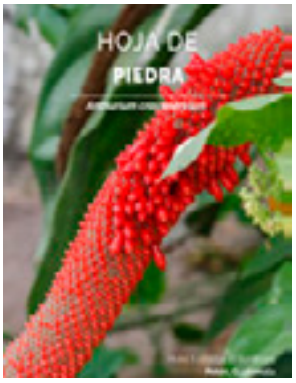
For Social Media

You can post any of the FLAAR Mesoamerica PDFs about the Municipio of Livingston on your Social Media sites; you can send any of these PDFs to your friends and colleagues and family: no cost, no permission needed.

FLAAR MESOAMÉRICA

Back Cover Photograph
Nymphaea ampla
Photograph by: María Alejandra Gutierrez. FLAAR Mesoamerica. March, 14, 2020. El Golfete, Livingston. Camera: SONY DSC-RX10M4. Lens:Sony FE 200-600mm G OSS Settings: 1/3200, f/4, ISO500.

OTHER PUBLICATIONS OF **THE FLORA OF GUATEMALA**



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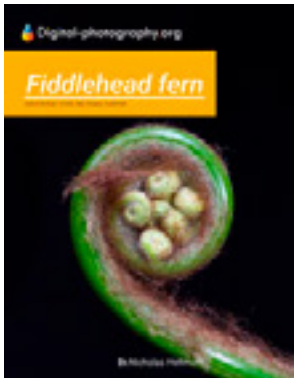

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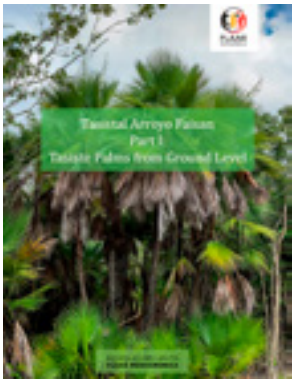

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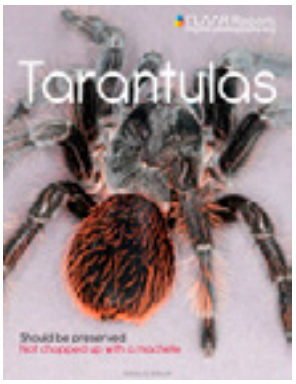

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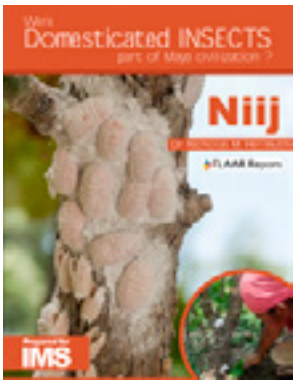

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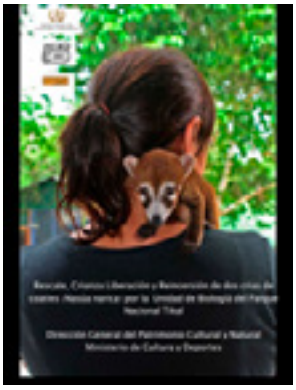

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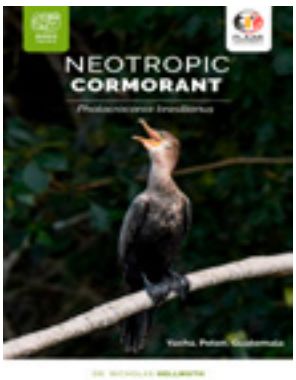

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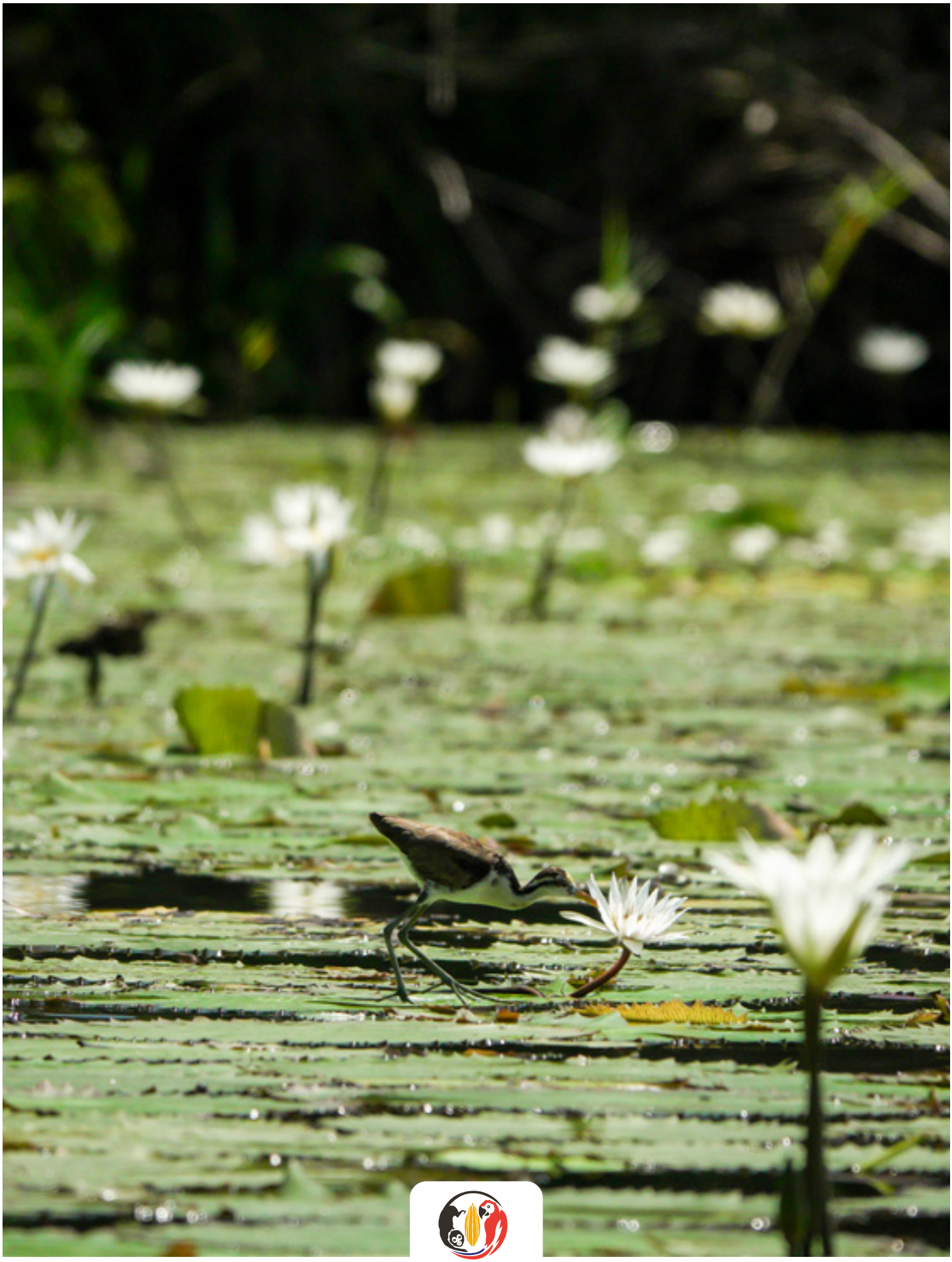

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