



FLORA
YAXHA



FLAAR
MESOAMÉRICA

TREE CACTI

Selenicereus testudo
(Karw. ex Zucc.) Buxb.

Cactaceae



Yaxha, Petén, Guatemala

TREE CACTI

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AUTOR

Nicholas Hellmuth

EDITION IN SPANISH

Vivian Díaz

Marcella Sarti

Elena Siekavizza

EDITION ENGLISH VERSION

María José Rabanales

PHOTOGRAPHY

Nicholas Hellmuth

David Arrivillaga

Erick Flores

ART AND DESIGN DIRECTOR

Andrea Sánchez Díaz

DIAGRAMMING OF SPANISH VERSION

Andrea Sánchez Díaz

DIAGRAMMING OF ENGLISH VERSION

Carlos Marroquín

LOCAL KNOWLEDGE OF PLANTS AND ANIMALS

Moisés Daniel Pérez Díaz

This report was made with the cooperation of the administrators of the Yaxha, Nakum and Naranjo National Park to share knowledge about the neotropical flora and fauna that exists in this area of Guatemala. This material can be used by students, teachers, and researchers to communicate the potential of Yaxha, Nakum and Naranjo Park for research and tourism. It also includes a learning tool for biodiversity conservation for any person and organization.



PHOTOGRAPH FROM COVER:

Selenicereus testudo. (Karw. ex Zucc.) Buxb. Turtle Pitaya. Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Yaxha, Nakum and Naranjo Park, Petén, Guatemala. Camera: Canon EOS-1Ds Mark II. Lens: EF100mm Macro USM. Settings: 1/10 sec; f/18; ISO 200.

PHOTOGRAPH FROM CREDITS PAGE:

Selenicereus testudo. (Karw. ex Zucc.) Buxb. Turtle cactus next to *Tillandsia*. Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Yaxha, Nakum and Naranjo Park, Petén. Camera: Nikon D5. Lens: Nikon AF-S NIKKOR 800mm FL ED VR. Settings: 1/250 sec; f/13; ISO 800.



PHOTOGRAPHY FROM CONTENT PAGE:

Selenicereus testudo. (Karw. ex Zucc.) Buxb. Turtle cactus.
Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Yaxha, Nakum and Naranjo Park.
Camera: Nikon D5. Lens: Nikon AF-Micro-NIKKOR 200mm IF-ED Macro. Settings: 1/10 sec; f/4.0 f/11, ISO 16,000.

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SERIE





FLAAR Mesoamerica (**Foundation for Latin American Anthropological Research**) is a nonprofit Guatemalan institution founded under the direction and enthusiasm of experienced Biologist Eduardo Sacayón and Dr Nicholas Hellmuth. Dr Hellmuth, a specialist of Classic Mayan iconography and temple-pyramid, palace and ballcourt architecture. Hellmuth's research evolved to focus on edible and utilitarian plants of the biodiverse ecosystems of Guatemala that were available to the Maya of past and present.

The work done at FLAAR Mesoamerica consists of the methodological compilation of facts about nature, flora, fauna, history, and cultures of Mesoamerica. It also includes publishing it to a larger audience, both in Guatemala and around the world. One goal is to promote the country around the world for its diversity of birds, pollinators, mammals, amphibians, reptiles, photogenic flowering and non-flowering Neotropical plants in wetlands, forests, savannas, and other remarkable habitats from bosque seco, monte espinoso, seasonal rain forests to cloud forests.

We have an experienced team specialized in advanced high-resolution digital photography and wide-format inkjet printing. Our in-house graphic designers can produce educational material about nature to donate to school classrooms in remote mountain and rain forest areas. Our Mayan-speaking team facilitates having our educational material in several Mayan languages, and we will be adding material in Garifuna for our project in Municipio de Livingston.

Likewise, our work has arisen from the interest and support of the board directors of FLAAR Mesoamerica, President Flor de María Setina, Vice president María Alejandra Gutiérrez, Secretary Rodrigo Girón, Treasurer Oscar Lambourg, and (Vocal) 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.

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 to generate materials that are easy to read, educational, reliable, and visually pleasing by using lots of full-color photographs -just like this report!

Our newest project is to adequate this technical information to help children learn about biodiversity and how to protect endangered species by MayanToons books and educational animated videos. Our illustrated books and animations are made 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 country.

We are open to work with 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-ethnozology.org
www.maya-ethnobotany.org



NATIONAL PARK

YAXHA, NAKUM AND NARANJO

Yaxha, Nakum and Naranjo National Park is a site of great natural and cultural importance for our country. Because of the diversity of species it holds, it is listed as a RAMSAR site because it includes three types of wetlands identified by the Wetland Convention: temporal lagoons, karstic systems, and peat bogs. From these systems stand out the Lagoon Yaxha and Lagoon Sacnab, Lankaja, Champoxte and Juleque reservoirs from the Lagoon Yaxha.

In reference to the cultural importance that this protected area represents is that it contains heritage from the Prehispanic Mayan period that includes 292 recognized sites, from which four are monumental archaeological sites: Yaxha, Nakum, Naranjo, and Topoxte. Other six intermediate archaeological sites include: Naranjito, El Carmen, La Pochitoca, Poza Mayor, el Bajón y el Pital, with other 282 minor archaeological sites within (Plan Maestro PNYNN, 2006).



Laguna Yaxha (Yaxha Lagoon), one of the RAMSAR-declared wetland systems. Photo by: María Alejandra Gutiérrez. FLAAR Mesoamerica, Yaxha, Petén, Guatemala. Camera: Canon 60D. Lens: Canon EF 300mm IS II USM. Settings: 1/320 sec; f/4; ISO 4000.

PREFACE

In Mexico's and Guatemala's deserts I have seen a great variety of cacti, from the tall candelabra cactus to the more recognized cacti of the genus *Opuntia* (the edible prickly pears). According to the National Council of Protected Areas (CONAP by its acronym in Spanish, 2011) this genus is listed on the Guatemalan Gray List of exotic and invasive exotic species. CONAP includes these species in the Gray List taking into account the knowledge of the manageable risk of the species, its invasiveness or if its invasive potential is unknown.

I have even seen these cacti in the region of Petén (although they have been introduced from other areas). From my experience, these species have been introduced through its domestication over the years by the Mayan communities that have inhabited these lands. A good example of this type of domestication is the izote (*Yucca gigantea* Lem.) which can be found in every garden or kitchen around Parque Yaxha and Parque Naranjo. The izote is not native to this area, but was introduced and domesticated many years ago. Other species that are not native but still grow and are used by the communities are banana (*Musa x paradisiaca* L.), and pineapple (*Ananas comosus* (L.) Merr.), to mention a few.

The inhabitants of these countries, and also of Honduras, surround their homes with these plants, known as "living fences", as the plants are placed on the perimeter of a property to protect it and create a natural barrier, in this case made with cacti. I remember seeing hundreds of cacti on the fences of houses in Oaxaca, Mexico. I have also seen several fences with candelabra cacti in the dry area of the Motagua River on the road to Puerto Barrios. In fact, many cacti can also be seen in the dry areas along the Sacapulas River within the Guatemalan highlands.

- DR. NICHOLAS HELLMUTH
FLAAR USA - FLAAR MESOAMERICA



Living fence. Cactus placed as the barrier of a farm on the side of the CA-9 North road km 66 in the municipality of Guastatoya, El Progreso, Guatemala.
Photo by: Erick Flores, FLAAR Mesoamerica, CA-9 North Highway, Guastatoya, El Progreso, Guatemala.
Camera: Canon PowerShot G16. Settings: 1/2000 sec; f/2.2; ISO 80.

CACTI IN HUMID AREAS

Although cacti are the most representative plants of arid places, upon arriving to humid areas such as Izabal, Alta Verapaz and Petén we have observed cacti with a certain peculiarity: they are found climbing up trees, or on top of rocks. Seeing this type of cactus has awakened our interest to look for more species and learn more about them. Previously, we have observed the same type of cactus climbing up rocks or cliffs around Lake Atitlan. It is worth noting that, in various parts of the world, several species of the Cactaceae family are commonly called “pitayas”.

So far, while exploring the Yaxha, Nakum and Naranjo area we have not observed any arid areas where cacti can grow. However, we have seen climbing cacti on trees, large rocks or on a log that has fallen to the ground. The flower of *Selenicereus testudo* (Karw. ex Zucc.), object of study in this photographic report, is one of the most spectacular flowers of “arboreal” cacti that happens to open in the evenings in front of the most emblematic temple of the site of Yaxha, Structure 216. This climbing plant is commonly known as **Turtle Pitaya** (Schulze, 2004).



S. testudo. Tortoise cactus.
Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Yaxha, Petén, Guatemala.
Camera: Canon EOS-1Ds Mark II. Lens: Canon EF 100MM Macro USM.
Settings: 1/10 sec; f/18; ISO 200.



S. testudo. The stems of the tortoise cactus can reach down from high above, all the way to the ground.
 Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Yaxha, Petén, Guatemala.
 Camera: Nikon D810. Lens: Nikon AF-S Micro 60mm G. Settings: 1/4 sec; f/10; ISO 80.



Nocturnal flowers are characterized by opening during the afternoon and evening to be available for their nocturnal pollinators (Raven, Evert, & Eichhorn, 1992).

PHOTO SEQUENCES AND NIGHT FLOWERS

FLAAR Mesoamerica and its photography team have already had the opportunity to photograph flowers as they open. We have photographed different types of nocturnal flowers in the wild that require us to experiment (or improvise at times) with various types of lighting. Such as we have done with the flowers of *Ipomoea alba* L., which bloom constantly in our ethnobotanical garden in Guatemala City. For the turtle pitaya, in front of the Templo de las Manos Rojas, we wanted to take hundreds of photographs at every moment. Tecó (Moisés Daniel Pérez Díaz, the PNYNN ranger) who accompanies us most of the time, suggested that the cactus button was going to open in a couple of hours that evening.

Knowing that the opening was going to take part of the night, with the necessary arrangements and authorization from the administration of the PNYNN, we requested a permit to stay inside the Park for the necessary time, next to the tree with the cactus at the top located in front of Temple 216. Without a doubt, this would be the first sequence of high-quality photos of one of the “most common” flowers that exist in this region.



S. testudo. Tortoise cactus found near Temple 216. On the tree, left, the size of the climbing plant is seen.
Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Yaxha National Park, Petén, Guatemala.
Camera: Nikon D5. Lens: 35 mm. Settings: 1/80 sec; f/11; ISO 200.

THE MOMENT IT STARTS TO OPEN

In the first two hours we had only noticed a very subtle progress of the opening of the flower. It was not until 18:00 hours that its movements became more noticeable and we began to photograph it every 5 and 10 minutes, not wanting to lose even a moment of the opening. As it got darker, we required more light to illuminate the shots, however, that darkness allows Yaxha, Nakum and Naranjo Park to be a natural observatory. The park offers a camping area where you can see the stars, the planets, the constellations in the sky. It's spectacular!

The way the flower had to be illuminated was an adventure: without any portable lighting equipment, each team member held a flashlight for the photographers to capture all possible angles of the flower.



Nocturnal flowers have abundant diluted nectar and a strong odor, which they emit only at night to attract pollinators (Raisman, Gonzalez, & Aguirre, 2000).



S. testudo. Turtle cactus flower bud.
 Photograph by: Nicholas Hellmuth, FLAAR Mesoamerica,
 Yaxha, Petén, Guatemala.
 Camera: Nikon D5. Lens: Nikon AF-Micro-NIKKOR 200mm
 IF-ED Macro. Settings: 1/10 sec; f/11; ISO 16,000.



S. testudo. Tortoise cactus as the flower opens.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Yaxha, Petén.

Camera: Nikon D5. Lens: Nikon AF-Micro-NIKKOR 200mm IF-ED Macro. Settings: 1/100 sec; f/11; ISO 12800.



S. testudo. Tortoise cactus as the flower opens.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Yaxha, Petén.

Camera: Nikon D5. Lens: Nikon AF-Micro-NIKKOR 200mm IF-ED Macro. Settings: 1/100 sec; f/11; ISO 12,800.



S. testudo. Tortoise cactus as the flower opens.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Yaxha, Petén.

Camera: Nikon D5. Lens: Nikon AF-Micro-NIKKOR 200mm IF-ED Macro. Settings: 1/100 sec; f/11; ISO 12800.



8:23:58 p.m.

S. testudo. Turtle cactus flower fully open.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Yaxha, Petén.

Camera: Nikon D5. Lens: Nikon AF-Micro-NIKKOR 200mm IF-ED Macro. Settings: 1/100 sec; f/11; ISO 12,800.

After two hours, around 20:20 hours, we decided to stop the photo sequence. We would have loved to be able to document the bloom during the whole night, and even to capture the moment when it wilted. The step-by-step photographs of the opening of this flower can be a first approach to the study of nocturnal pollinators.

i!

Other nocturnal flowers in Yaxha National Park are the Night Gallant *Epiphyllum phyllanthus* (L.) and the red Pitaya *Hylocereus undatus* (Haw.)

Britton & Rose (Fialko, 2009).



S. testudo. One of the stems of the tortoise cactus climbing a tree trunk.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Yaxha Park, Petén, Guatemala.

Camera: Canon EOS-1Ds Mark II. Lens: Canon EF 100MM Macro USM. Settings: 1/10 sec; f/18; ISO 200.

BOTANICAL DESCRIPTION

According to The Plant List (2013), the accepted name for this cactus is *Selenicereus testudo* (Karw. ex Zucc.) Buxb. and its synonyms:

- *Cereus testudo* Karw. ex Zucc.
- *Deamia diabolica* Clover
- *Deamia testudo* (Karw. ex Zucc.) Britton & Rose
- *Selenicereus miravallensis* (F.A.C. Weber) Britton & Rose
- *Strophocactus testudo* (Karw. ex Zucc.) Ralf Bauer

One of the most important botanical descriptions of *S. testudo* is provided by Standley & Williams (1962), mentioned in Flora of Guatemala Part VII, as *Deamia testudo*.

It is a plant usually entangled on tree trunks or rocks by means of its aerial roots, often spiraling up the trunk; stems 3-10 cm wide or more; usually with 3 very slender wing-like ribs; areoles 1-2 cm; 10 or more spines scattered on each areole, the longest are 1-2 cm long and brownish; flowers fragrant, 28 cm long, tubular part about 10 cm long; inner segments of perianth linear, oblong, acuminate and 8-10 cm long; ovary scales 1 mm or less; areole hairs, on ovary and perianth, 1-3 cm long and brownish (Standley & Steyermark, 1962, p. 195).



S. testudo. Turtle cactus.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Yaxha, Petén, Guatemala.

Camera: Nikon D5. Lens: Nikon AF-Micro-NIKKOR 200mm IF-ED Macro. Settings: 1/10 sec; f/11; ISO 16,000.

PHOTOGRAPHY TIPS

- 📷 Always set the camera in RAW and JPEG format to have good files for post-production.
- 📷 When you have good lighting, natural or artificial, use low ISO values.
- 📷 It is advisable to have a good memory card to process files faster. For example, 512mb/s or at least 90mb/s.
- 📷 We avoid using zoom lenses. Since the flower was so high up it was best to take it with a 300mm telephoto lens.
- 📷 When taking pictures from a tripod it is always recommended to use a shutter release, to avoid “shake” in the picture.
- 📷 Almost 80% of the time, Nicholas, FLAAR Mesoamerica’s lead photographer, activates the mirror lock up (MLU) setting when shooting on a tripod. This mode is turned off when using flash lights, as it consumes more power.



Nikon D5 camera using a Nikon AF-S NIKKOR 600mm FL ED VR lens.

SPECIAL ACKNOWLEDGEMENTS

We thank

Lic. Leonel Ziesse –Coordinador Administrativo del Parque Nacional Yaxha, Nakum and Naranjo (DGPCyN / MICUDE),
Ing. Jorge Mario Vásquez –Jefe del Parque (CONAP),
Biolg. Lorena Lobos (CONAP),
and Arq. Jorge Mario Ortiz.

All the helpful and knowledgeable guides of IDAEH CONAP who accompanied us each day. It is essential to have either an IDAEH and/or CONAP guardabosque or comparable when doing flora and fauna research.

We appreciate the 16 years of knowledge of birds and plants of “Teco” (Moisés Daniel Pérez Díaz). We also appreciate the assistance of park ranger Ricardo Herrera. It is essential to have either an IDAEH and/or CONAP guardabosque or comparable when doing flora and fauna research.



S. testudo. Turtle cactus.

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica,
Yaxha, Petén, Guatemala.

Camera: Nikon D5. Lens: Nikon AF-Micro-NIKKOR 200mm
IF-ED Macro. Settings: 1/10 sec; f/11; ISO 16,000.

MUCH MORE THAN A PARK

The Yaxha, Nakum and Naranjo National Park raises within its objectives the protection and conservation of the natural resources of the area, as well the conservation of the ancient Mayan cities. Thanks to its natural beauty, the inspiration is for this place to be attractive to visitors and a source of income for the communities. Its also aims to be a tool for environmental education, scientific research and ecotourism, leveraging the natural potential that exists in this protected area.

That is why FLAAR Mesoamerica, with the support of the authorities that manage the park, has created the material you have in your hands, to generate interest among students, researchers and tourists visiting the area. FLAAR Mesoamerica has specialized in the photographic documentation of species of flora and fauna, and in the compilation of biological, botanical, ethnobotanical and ethnobiological research to make known the variety of natural resources that exist in the region.

For more information:

-  /PN_YNN
-  /pnynn.guatemala
-  /FLAARM

-  www.destinoyaxha.com
-  www.flaar-mesoamerica.org



HOW TO GET TO YAXHA?



MAP LEGEND

-  Archaeological sites
-  Airports
-  Earthworks
-  Highway



PROTECTED AREA



Go to the Mundo Maya airport in Santa Elena and then you will find a services of tourist vehicles to go to the archaeological site. If you want to go by car from Guatemala City, take the following route: Río Dulce - Poptún-Flores. At the junction further on you will find on the left the route to Tikal. Go straight on to the right towards Yaxha (towards Melchor de Mencos). In km. 521 at the village La Maquina, turn left to the site. Ecolodge El Sombrero is 50 meters before the entrance to National Park Yaxha - Nakum - Naranjo.

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BACK COVER PHOTOGRAPH:

S. testudo. Tortoise cactus captured with the camera without a tripod.
Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Yaxha, Petén, Guatemala.
Camera: Nikon D810. Lens: AF-S VR Micro-Nikkor 105mm IF-ED. Settings: 1/320 sec; f/10; ISO 8000.



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