

SOLID COROZO PALMS AROUND BOTANAL PALMS



FLAAR
MESOAMÉRICA

Part 2, May 11, 2022
Corozera with Botanal north of Yaxha

Parque Nacional Yaxha, Nakum and Naranjo
Reserva de la Biosfera Maya (RBM)
Peten, Guatemala

Nicholas Hellmuth

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FLAAR (USA) and FLAAR Mesoamerica
(Guatemala)

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FOR PROVIDING STORAGE SPACE FOR OUR CAMPING EQUIPMENT AND OTHER SUPPLIES

Ing. Sergio Balam

We appreciate a donation during November 2021 and a subsequent donation in early June 2022 to help cover the costs of FLAAR research projects specifically to assist and support the current FLAAR project of flora and fauna in the Reserva de la Biosfera Maya (RBM). This continuing donation also assisted the FLAAR (USA) and FLAAR Mesoamerica (Guatemala) research project searching for wild edible plants in the wetlands of the Municipio de Livingston area of the departamento of Izabal, Guatemala.

These donations are from a family in Chicago in honor of the decades of botanical field work of botanist Dr John D. Dwyer, who worked in many areas of Mesoamerica, including in the Yaxha area in the 1970's while the site was being mapped by FLAAR.

This donation is also in recognition of the urgency and need for conservation of both wildlife and rare plants in the bio-diverse ecosystems of the Reserva de la Biosfera Maya (RBM) of Guatemala. Parque Nacional Yaxha, Nakum and Naranjo (PNYNN), Parque Nacional Laguna de Tigre (PNLT), and wetlands of Municipio San Jose are three areas that we are focusing on within the over 5 million acres of the RBM..



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INTRODUCTION TO THE COROZERA NORTH OF YAXHA, PNYNN, PETEN, GUATEMALA

Corozera is the word used in this part of Peten to refer to an area of almost solid corozo palms. It is like being in a literal jungle of thousands of corozo palms. The more common word for an area of lots of corozo palm is corozal. So most botanists call these areas a corozal.

- Lots of pita = pital
- Lots of guano = guanal
- Lots of escoba = escobal
- Lots of palo de tinto (palo de tinte) = tintal
- So, lots of corozo palms = corozal

But, in the PNYNN area of Peten, local people call the areas of corozo palm a corozera.

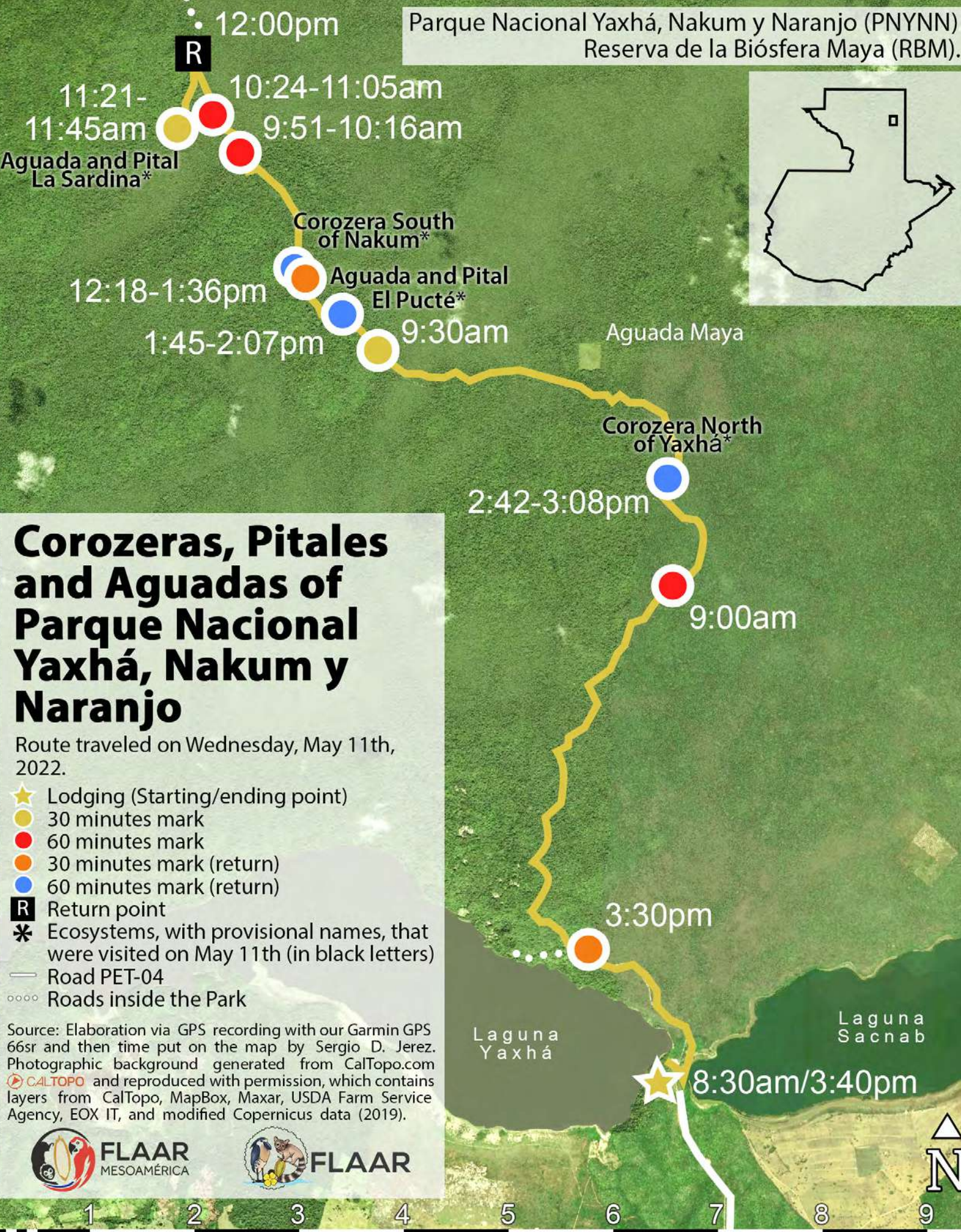
The two corozeras between Yaxha and Nakum are each in a flat area usually named a “bajo.” But the bajo surrounding these two corozeras have multiple species of high trees; and many of these trees also grow mixed between the corozo palms. So none of this area is a low bajo forest whatsoever; that type of bajo exists elsewhere between Yaxha and Nakum but not surrounding the two corozo palm areas. The rectangular Aguada Maya (also known as Poza Maya) is in Bajo la Justa so we need to check whether both corozeras between Yaxha and Nakum are also in this Bajo la Justa. 90% of the capable field work in the bajos of PNAT and PNYNN have been to find house mounds and larger Maya settlements. So it would help to find whether these bajos have not been studied by REA or comparable botanical projects. The list of “trees of Yaxha” circa 1992 was based on quick survey of the site of Yaxha; I doubt these botanists studied the area between Yaxha and Nakum nor around Naranjo-Sa’al whatsoever. So we (FLAAR Mesoamerica) felt it would help to begin to study the ecological aspects of the area between Yaxha and Nakum. We initiate this with:

- Corozera North of Yaxha (Corozera-Botanal)
- Corozera South of Nakum (Corozera Ceiba)
- Pital La Sardina
- Pital El Pucte
- Pital El Tigre (slightly outside the west edge of PNYNN).

Once we finish the two volumes on the corozeras we will work on a volume to cover the pital areas (an area around a seasonally dry aguada that has solid *Aechmea magdalenae* above the edge of the aguada).

Since there are so many botan palms in the corozera north of Yaxha we name it Corozera-Botanal North of Yaxha. A shorter name is Corozera North of Yaxha.

Parque Nacional Yaxhá, Nakum y Naranjo (PNYNN)
Reserva de la Biósfera Maya (RBM).



Corozeras, Pitaless and Aguadas of Parque Nacional Yaxhá, Nakum y Naranjo

Route traveled on Wednesday, May 11th, 2022.

- ★ Lodging (Starting/ending point)
- 30 minutes mark
- 60 minutes mark
- 30 minutes mark (return)
- 60 minutes mark (return)
- R** Return point
- * Ecosystems, with provisional names, that were visited on May 11th (in black letters)
- Road PET-04
- Roads inside the Park

Source: Elaboration via GPS recording with our Garmin GPS 66sr and then time put on the map by Sergio D. Jerez. Photographic background generated from CalTopo.com [CALTOPO](#) and reproduced with permission, which contains layers from CalTopo, MapBox, Maxar, USDA Farm Service Agency, EOX IT, and modified Copernicus data (2019).



km

COROZERAS CAN ALSO BE ON HILLSIDES

On the subject of corozeras being in a totally flat area, all you have to do is drive towards Sacpuy (drive there from the west end of Lake Peten Itza) and you see kilometer after kilometer of areas cleared for cattle ranches but there are hundreds of mature corozo trees growing on hillsides. Same when you drive from Melchor de Mencos towards the ruins of Naranjo-Sa'al, there are comparable stands of mature corozo palms on hillsides in the cattle ranches. I estimate that these areas were once non-bajo corozeras because when you enter the Naranjo-Sa'al part of PNYNN you see thicker areas of corozo growing on the hills that have been protected from encroachment of the slash-and-burn agriculture and cattle ranches that obliterate the forests.

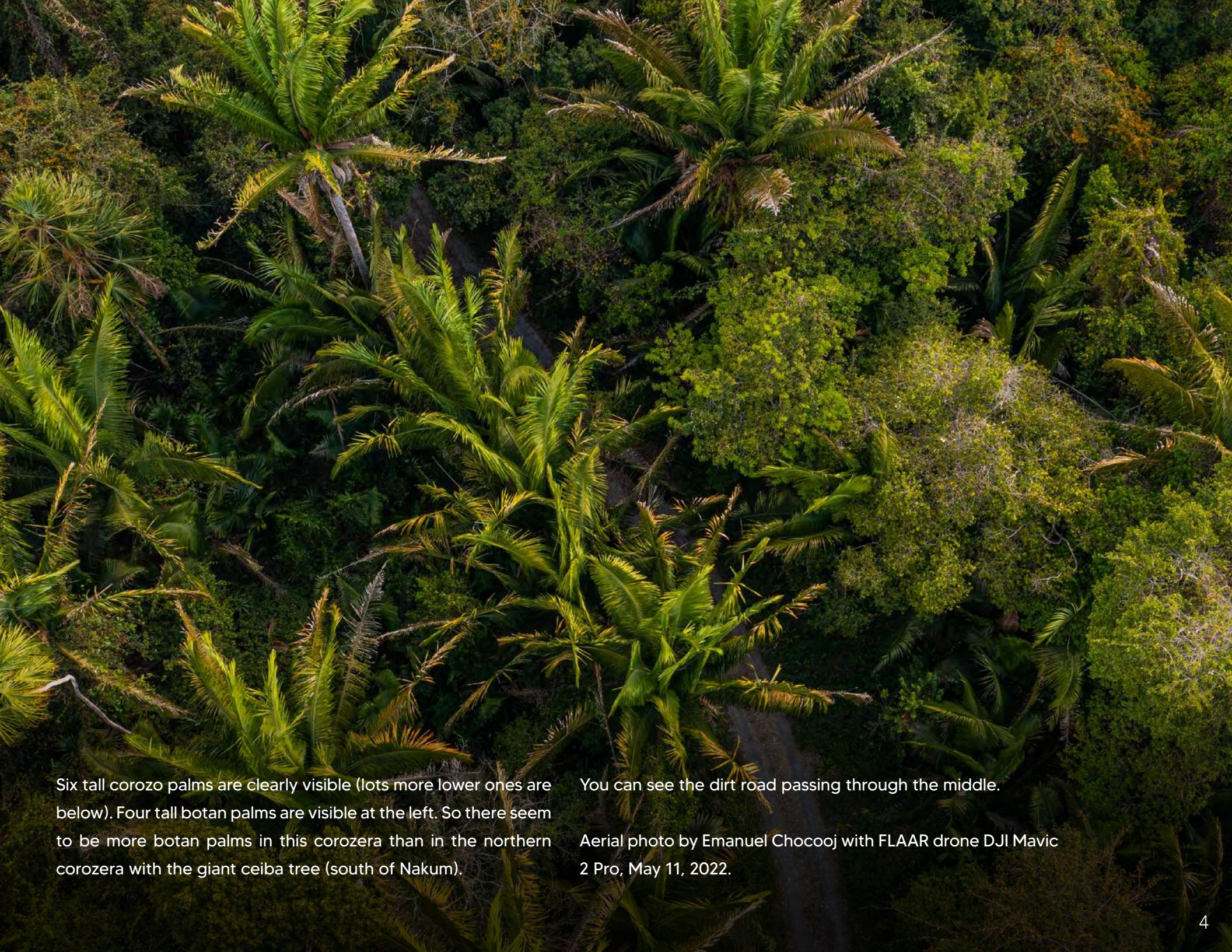
I estimate that driving from Sayaxche to the south you will also notice thousands of corozo palms. Some of these areas were perhaps corozeras in the past. But since these palms are not always exterminated when making cattle pastures, in the recent 60 years (the time when Peten forests were exterminated for cattle pastures) perhaps the corozo palm in areas of rolling hills simply multiply because their leaves are useful for thatching houses of local people.

MY PERSONAL EXPERIENCE WITH COROZO PALMS

I got to know guano, xate, pacaya and escoba palms while working at Tikal for twelve months of 1965, but it was in the seasonally inundated area between Yaxha and Nakum where I first experienced a corozera. I first hiked through these corozeras in the early 1970's. Our goal was to get to Nakum to document the looting at Nakum to document that the temples and acropolises of Nakum deserved to be protected. There was no national park, so no park rangers in these years. I can still remember the "jungle atmosphere" of kilometer after kilometer of corozo palms on all sides as you hiked through this bajo.

In subsequent years I enjoyed this "palm jungle experience" on many visits to Yaxha and Nakum. I also like tasiste palm "rain forests" but the tasiste palms are so thick you can't walk through and the spines or thorns also hinder you from entering. Also they don't grow very tall because these savannas are burned by intrusive hunters at least every two years. Plus the long leaves of corozo palm are more romantic en masse than guano, botan, or escoba palms.

When you drive through most areas of southern Mexico and Central America you often see thousands of these palms out in cattle fields (because local people need leaves to thatch the roofs of their homes). Guano palm is considered longer lasting for roof thatch but the leaves of corozo are giant size in comparison.



Six tall corozo palms are clearly visible (lots more lower ones are below). Four tall botan palms are visible at the left. So there seem to be more botan palms in this corozera than in the northern corozera with the giant ceiba tree (south of Nakum).

You can see the dirt road passing through the middle.

Aerial photo by Emanuel Chocooj with FLAAR drone DJI Mavic 2 Pro, May 11, 2022.



Lots of corozo up and down the middle; widely spaced botan palm.

Aerial photo by Emanuel Chocooj with FLAAR drone DJI Mavic 2 Pro, May 11, 2022.



Botan palm but not very tall. Short corozo palms visible at left and right.

Aerial photo by Emanuel Chocooj with FLAAR drone DJI Mavic 2 Pro, May 11, 2022.



Tall corozo palm visible everywhere; lots of trees also. The botan palms are widely scattered. Their inflorescences stick out horizontally or diagonally.

The gold-colored areas in the tree canopy is estimated to be a vine, possibly a parasitic vine (these particular vines don't seem to kill the host tree).

Aerial photo by Emanuel Chocooj with FLAAR drone DJI Mavic 2 Pro, May 11, 2022.



Corozo palms everywhere across the lower 60%. Not many botan palms visible unless you really look carefully on a 32" 4K monitor. But this outer area seems to have fewer botan than the area near the road.

Aerial photo by Emanuel Chocooj with FLAAR drone DJI Mavic 2 Pro, May 11, 2022.



When you raise the drone up you can see Aguada Maya (Poza Maya). This is a rectangular area partially modified by the Classic Maya. The corozera does not reach the Aguada.

Emanuel Chocooj with FLAAR drone DJI Mavic 2 Pro, May 11, 2022.



Here I can see more botan palms. This is why it would help to have a 100-megapixel drone with multi-spectral capability. This would enable you to map each different tree species and hopefully detect the difference between botan palm and corozo palm.

Aerial photo by Emanuel Chocooj with FLAAR drone DJI Mavic 2 Pro, May 11, 2022.



Team of FLAAR Mesoamerica packing equipment after visit to the Corozal-Botanal in Feb. 17, 2019.

FULL BOTANICAL NAME OF BOTAN AND GUANO PALM

Cyrus Lundell worked for many years in Peten; yet he also shows that the guano/botan palm species could not always be identified as to species: so for Uaxactun he says merely *Sabal* sp.. No species name (caption for illustration vi).

Again no species name, vii. Same for pages 27, 30, 38, 192, 193, 196 no species name. But on pages 41, 53, 106, 157, 161, he lists *Sabal mexicana*. Another palm he estimates is *Sabal morrisiana* (ibid.: 53). So we show the options of which species could be present.

No matter what the species, the family name is ARECACEAE.

Sabal mauritiiformis (H. Karst.) Griseb. & H. Wendl. ex Griseb. – **Syn:** *Sabal morrisiana* Bartlett ex L.H. Bailey; *Sabal nematoclada* Burret – **Loc Use:** CNST. – **Reg Use:** CNST. – **Nv:** bayleaf palm, botán. – **Habit:** Palm.

Sabal yapa C. Wright ex Becc. – **Syn:** *Sabal mayarum* Bartlett – **Loc Use:** FOOD, PRD, CNST. – **Reg Use:** MED, CNST, FIBR. – **Nv:** bay leaf palm, botan, botán, big thatch, huano, thatch palm. – **Habit:** Palm.

(Balick, Nee and Atha 2000: 194).



HERE ARE SYNONYMS FOR BOTAN AND GUANO PALM

The full botanical name for *Sabal mauritiiformis* is a tad excessive: (H.Karst.) Griseb. & H.Wendl. So, sorry, no space in the tabulation other than Genus species.

Sabal mexicana is not listed for Belize, at least not in year 2000 (Balick, Nee and Atha, page 196). But if *Sabal mexicana* is found in Quintana Roo surely it has been found in Belize in recent years. So, if you dedicate more time to library research, and on-line, you find all three palms listed for Belize (Bridgewater, Garwood and Brewer 2007: 8).

<i>Sabal mauritiiformis</i>	<i>Sabal mexicana</i> Mart.	<i>Sabal yapa</i> C.Wright ex
<i>Sabal allenii</i> L.H.Bailey	<i>Erythea lorentensis</i> M.E.Jones	<i>Inodes yapa</i> (C.Wright ex Becc.) Standl.
<i>Sabal coerulescens</i> auct.	<i>Inodes exul</i> O.F.Cook	<i>Sabal mayara</i> Bartlett
<i>Sabal glaucescens</i> Lodd. ex H.E.Moore	<i>Inodes mexicana</i> (Mart.) Standl.	<i>Sabal peregrina</i> L.H.Bailey
<i>Sabal morrisiana</i> Bartlett ex L.H.Bailey	<i>Inodes texana</i> O.F.Cook	<i>Sabal yucatanica</i> L.H.Bailey
<i>Sabal nematoclada</i> Burret	<i>Sabal exul</i> (O.F.Cook)	
<i>Trithrinax mauritiiformis</i> H.Karst	<i>Sabal guatemalensis</i> Becc.	
	<i>Sabal mexicana</i> Sauvalle	
	<i>Sabal texana</i> (O.F.Cook) Becc.	

Tabulation of where each palm species has been documented in adjacent Mexico (Villaseñor 2016: 59). The Quintana Roo area of Mexico borders Belize. Chiapas, Tabasco, Campeche, and Belize all border Peten. So most plants in these areas should also be findable in Peten; and any plant found in Quintana Roo is usually eventually found in adjacent Belize.

<i>Sabal mauritiiformis</i>	<i>Sabal mexicana</i> Mart.	<i>Sabal yapa</i> C.Wright ex
	Found in almost every part of Mexico so I list here only Maya Lowlands presence.	
Campeche	Campeche	Campeche
Chiapas	Chiapas	
Quintana Roo	Quintana Roo	Quintana Roo
Tabasco	Tabasco	
VER		
Yucatan	Yucatan	Yucatan
ZAC		

The Mayan names for *Sabal* palm species will vary depending upon which Mayan language; Xa'an is the most common.

Local names for *Sabal* palms.

<i>Sabal mauritiiformis</i>	<i>Sabal mexicana</i> Mart.	<i>Sabal yapa</i> C.Wright ex
bayleaf palm, botán	Mexican palmetto	bay leaf palm, botan, botán, big thatch, huano, thatch palm

(Balick, Nee and Atha 2000: 196)

<https://tropical.theferns.info/viewtropical.php?id=Sabal+mexicana> (for *Sabal mexicana*)

<i>Sabal mauritiiformis</i>	<i>Sabal mexicana</i> Mart.	<i>Sabal yapa</i> C.Wright ex
Construction	Edible, basketry, roof thatch	Loc Use: FOOD, PRD, CNST. – Reg Use: MED, CNST, FIBR.

(Balick, Nee and Atha 2000: 196)

<https://tropical.theferns.info/viewtropical.php?id=Sabal+mexicana> (for *Sabal mexicana*)

ThePlantList has *Sabal mayara* Bartlett, but there are two synonyms, *Sabal mayara* Bartlett and *Sabal mayarum* Bartlett, primarily for Belize.

Sabal mayarum Bartlett is a synonym of *Sabal japa* C. Wright ex Becc.

Sabal mayara Bartlett is a synonym of *Sabal yapa* C.Wright ex Becc.

Typical mish-mash of botanical jargon: Both *Sabal japa* and *Sabal yapa* are accepted names

(www.ThePlantList.org).

<i>Sabal mauritiiformis</i> <i>Sabal morrisiana</i> (sic) <i>Sabal nematoclada</i>	<i>Sabal mexicana</i>	<i>Sabal yapa</i>	<i>Sabal mayarum</i> synonym of <i>Sabal japa</i> (ThePlantList)
Peten, Belize	Dry areas "along Motagua Valley in El Progreso and Zacapa"	Not listed nor under any synonym.	Belize

(Standley and Williams 1958: 287-289).

HABIT FOR COROZO AND GUANO OR BOTAN

Palm.

LOCAL NAMES FOR ATTALEA PALM

Called cohune in English and corozo in Spanish. Has other local names but these are the most common. As typical with local names, the identical name(s) can also be used for unrelated palms.

IN WHAT ECOSYSTEM(S) CAN YOU FIND NATIVE *ATTALEA COHUNE*?

Not limited to flat bajos whatsoever. Grows on hills also. Grows all over the place in Guatemala and surrounding countries. You see it at sea level along the coast of Amatique Bay, Municipio de Livingston, Izabal. Common at 250 meters elevation in the Reserva de la Biosfera Maya (RBM), of central Peten. Need to make a list of everywhere that we find it; tough since this palm is so common that we don't usually focus on it.

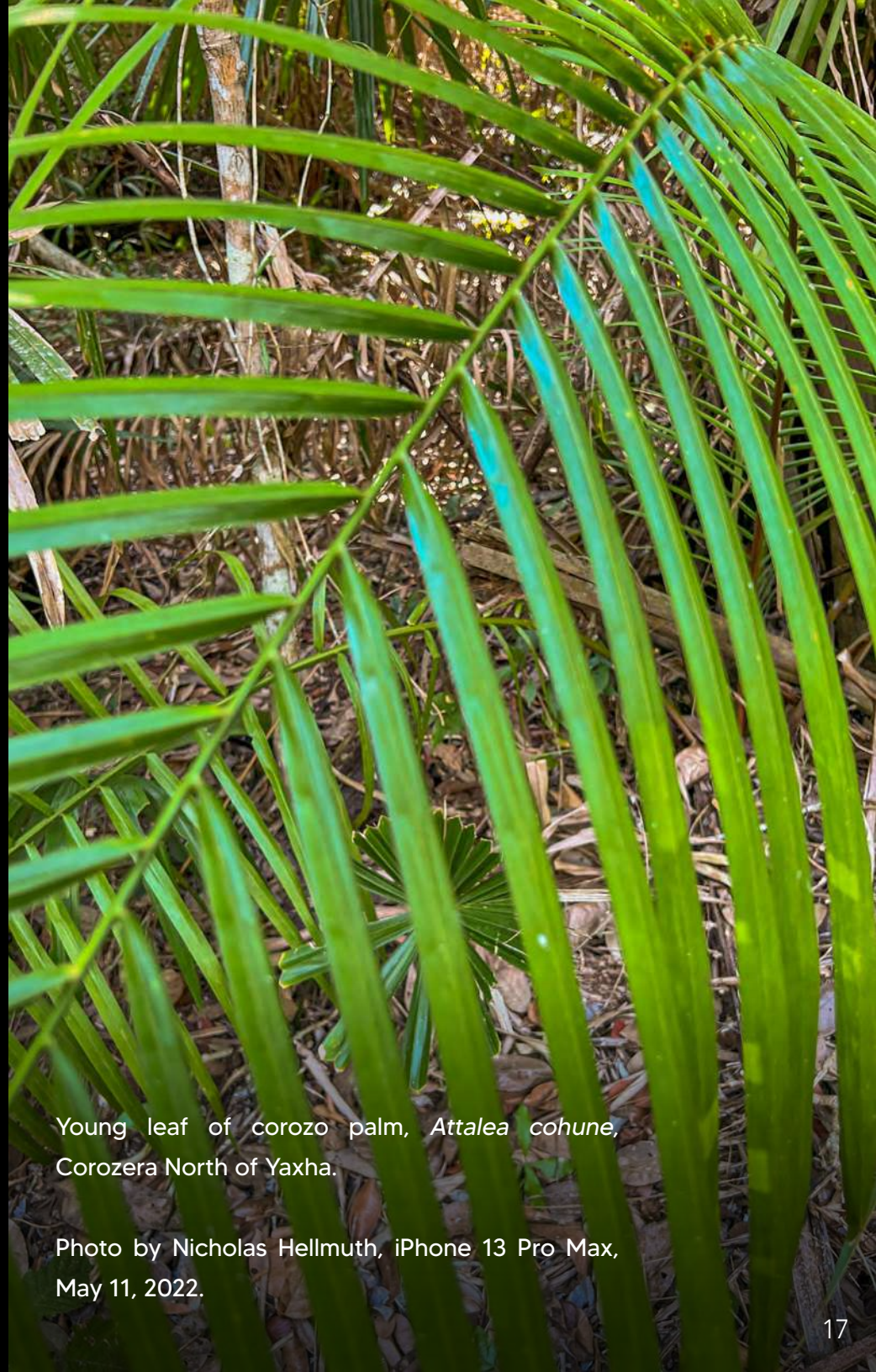
PHOTO ALBUM OF COROZO PALMS IN THE COROZERA NORTH OF YAXHA

Even though I have been in this corozera north of Yaxha more than a dozen times, I enjoy returning every time. Since we are usually in a hurry to drive further to or towards Nakum, we usually only photograph what you can see on both sides of the road. Someday in the future I would like to hike to the east and then to the west of the road (to reach the end of the corozera area on both sides). In the meantime, here are some photos from the ground.



Fresh growing end of a young leaf, before it opens up totally, *Attalea cohune*, Corozera North of Yaxha.

Photo by Nicholas Hellmuth, iPhone 13 Pro Max, May 11, 2022.



Young leaf of corozo palm, *Attalea cohune*, Corozera North of Yaxha.

Photo by Nicholas Hellmuth, iPhone 13 Pro Max, May 11, 2022.

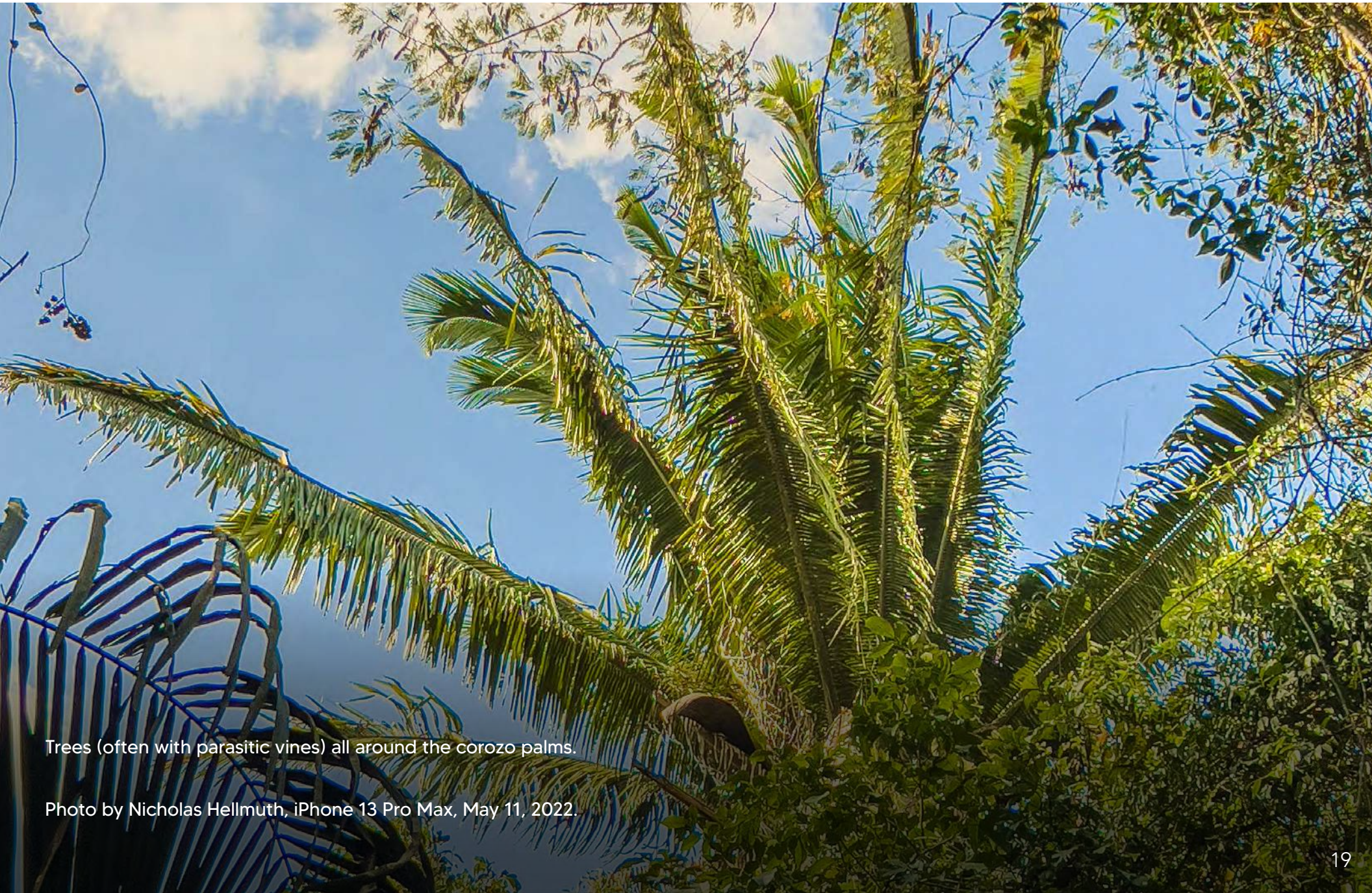


The old leaves fall over when wilted. Eventually the wind will blow them off the stem and they will fall to the ground.

Photo by Nicholas Hellmuth, iPhone 13 Pro Max, May 11, 2022.

LOOKING UP FROM BELOW

Always helps to photograph from below and with a drone camera from above. The image quality of an iPhone 13 Pro Max is perfect to illustrate web pages and reports



Trees (often with parasitic vines) all around the corozo palms.

Photo by Nicholas Hellmuth, iPhone 13 Pro Max, May 11, 2022.



Some corozo can grow quite tall but more are half that height.



From below looking up. I estimate that the angle of the parts of the leaves varies depending on how high up the tree, on whether young and fresh or old and wilting, and how much wind is blowing the leaves.

Corozera South of Nakum, photo by Nicholas Hellmuth, May 11, 2022, iPhone 13 Pro Max.

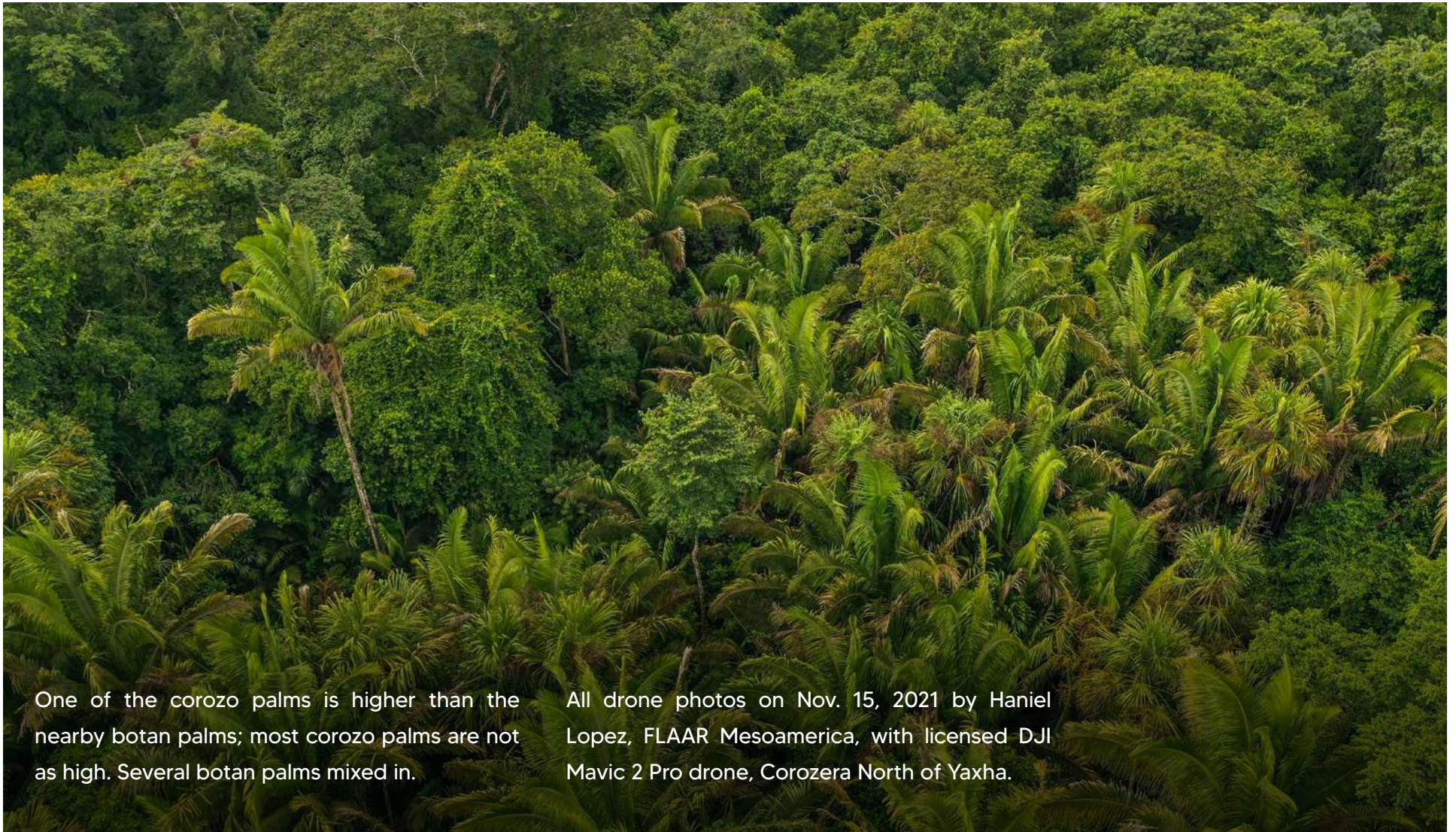


Tall corozo palm. The fresh leaves grow straight up. As the leaves get older (or as wind blows them) the leaves bend over.

Photo by Nicholas Hellmuth, Feb. 17, 2019. Nikon camera, so not an upward pano with an iPhone 13 Pro Max.

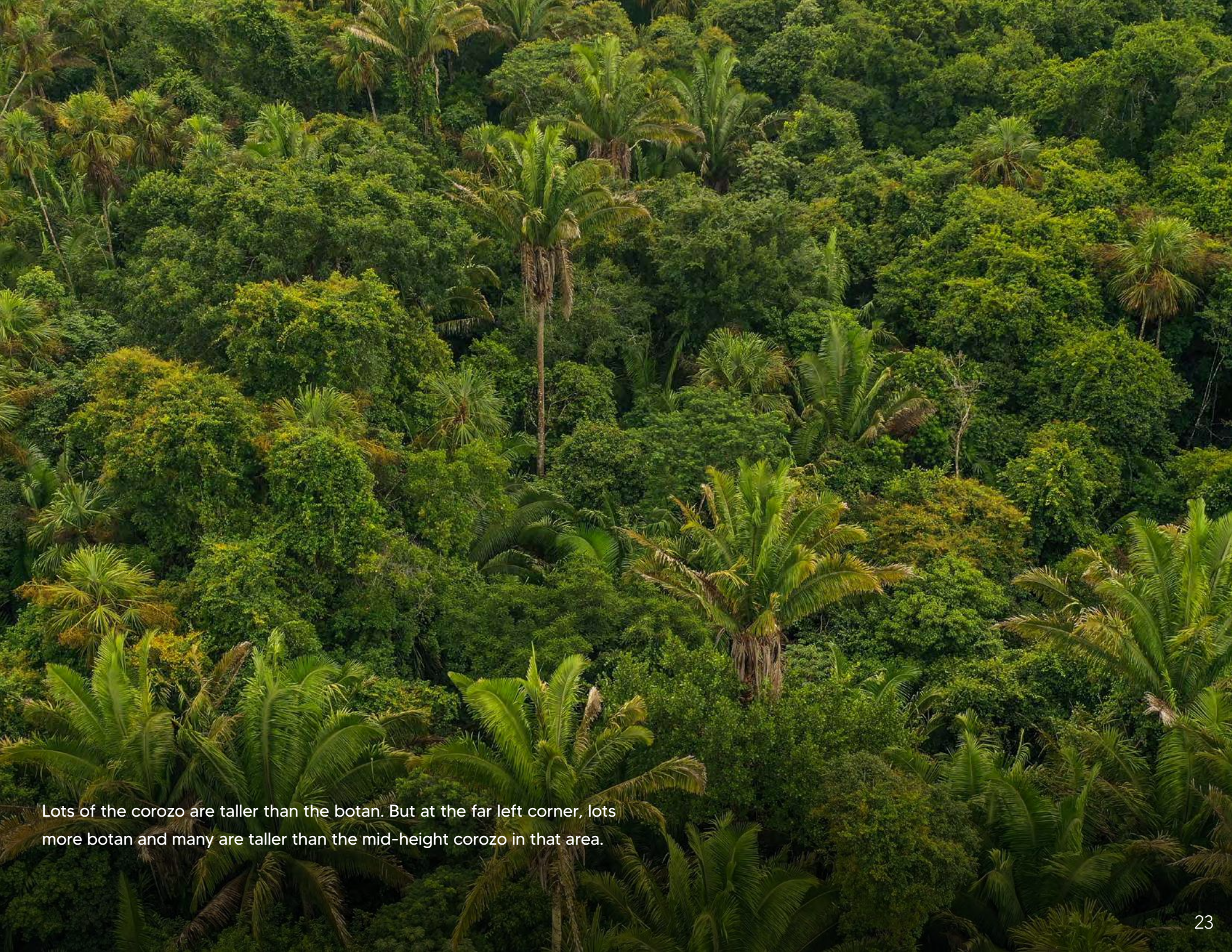
IN NOVEMBER 2021 WE ALSO ACCOMPLISHED AERIAL PHOTOGRAPHY OF THE COROZERA AREAS

Although we have photographed the corozeras from the ground during our 2018-2019 project we only began to do aerial photography once we realized how essential it was. So by 2021 we were doing aerial photography in our flora, fauna and ecosystem documentation project in the eastern half of Izabal and also in the RBM project in Peten. During November 2021 we brought the drone and drone pilot Haniel Lopez to do aerial photographs of both corozeras and both pital areas a kilometer or so away. Here I show samples from the November 2021 aerial photos.

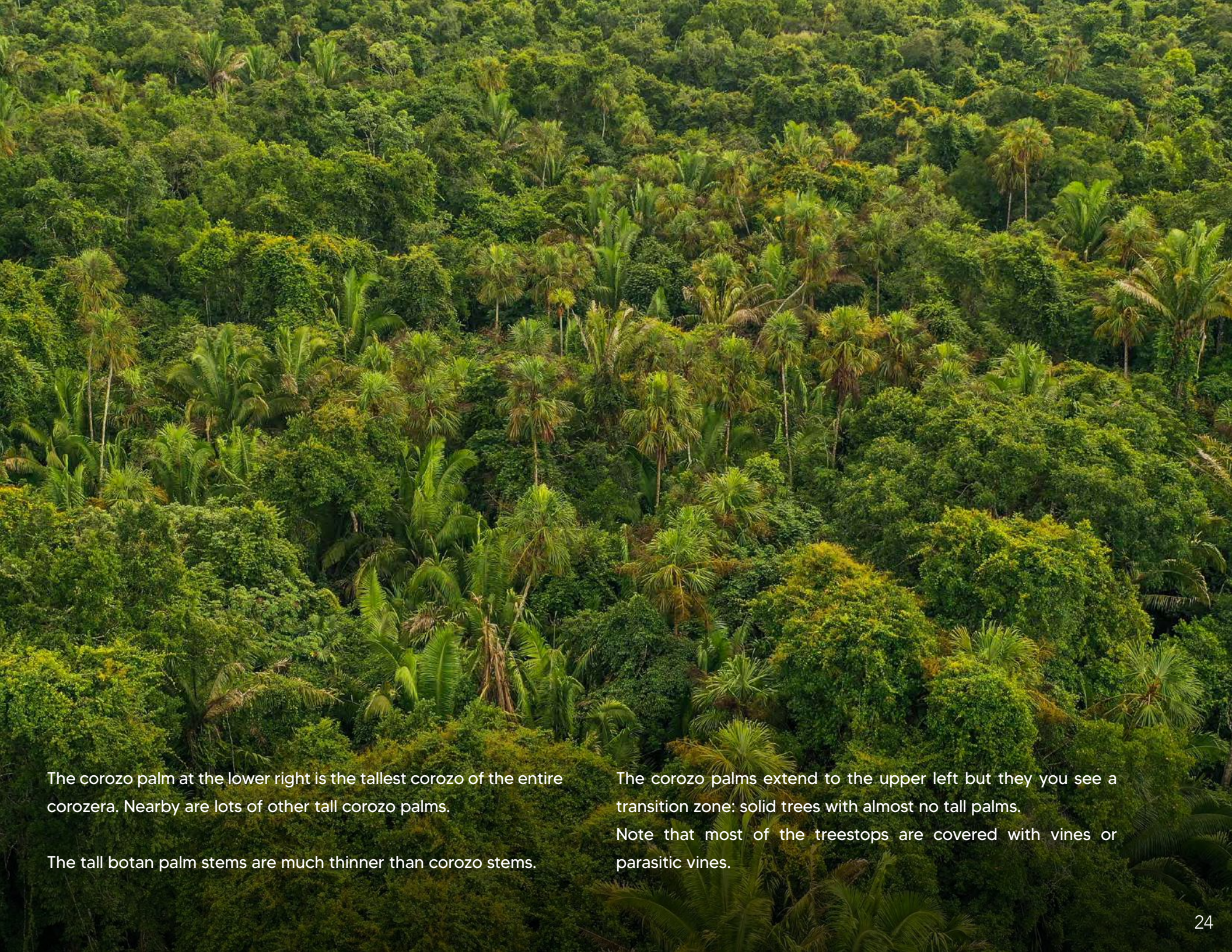


One of the corozo palms is higher than the nearby botan palms; most corozo palms are not as high. Several botan palms mixed in.

All drone photos on Nov. 15, 2021 by Haniel Lopez, FLAAR Mesoamerica, with licensed DJI Mavic 2 Pro drone, Corozera North of Yaxha.



Lots of the corozo are taller than the botan. But at the far left corner, lots more botan and many are taller than the mid-height corozo in that area.

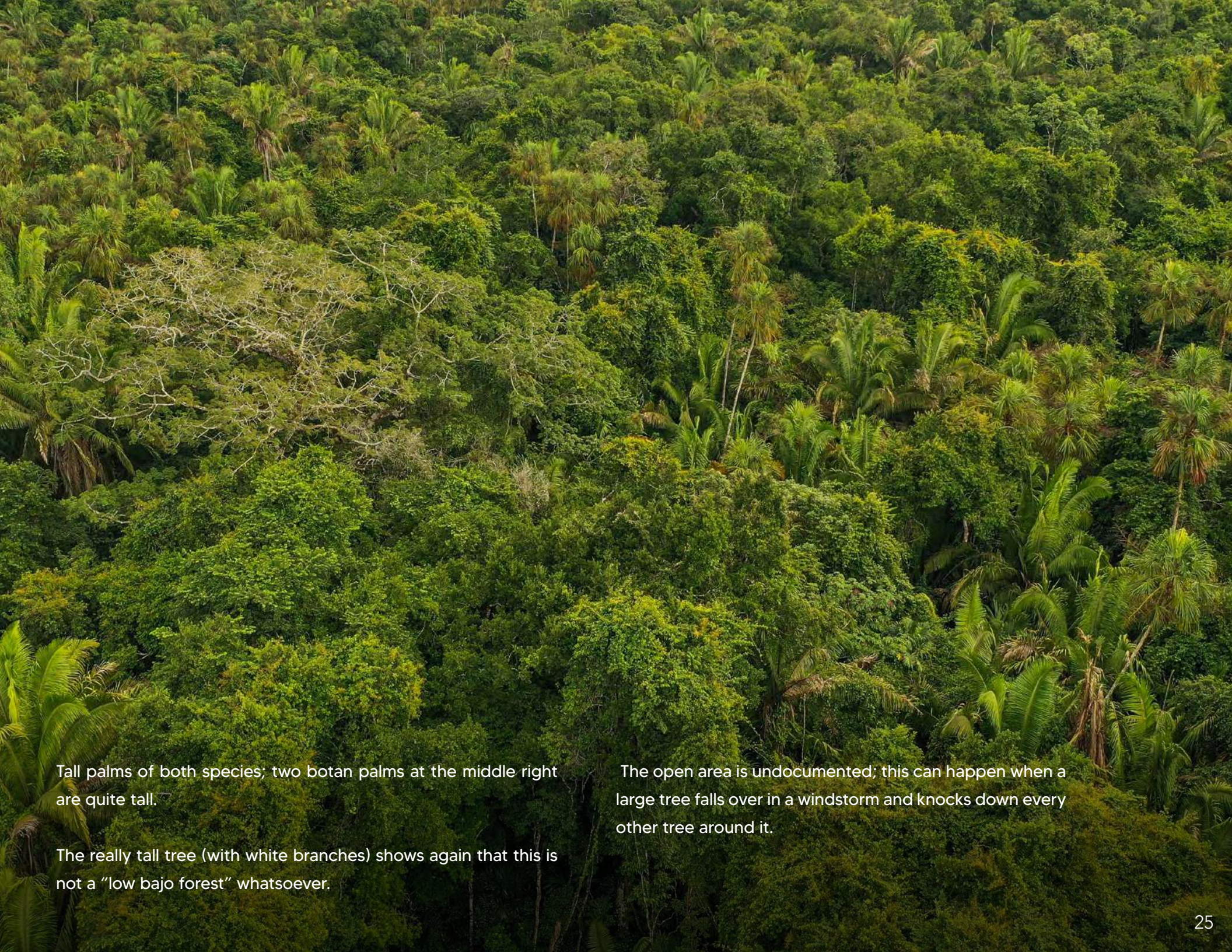


The corozo palm at the lower right is the tallest corozo of the entire corozera. Nearby are lots of other tall corozo palms.

The tall botan palm stems are much thinner than corozo stems.

The corozo palms extend to the upper left but they you see a transition zone: solid trees with almost no tall palms.

Note that most of the treestops are covered with vines or parasitic vines.



Tall palms of both species; two botan palms at the middle right are quite tall.

The really tall tree (with white branches) shows again that this is not a "low bajo forest" whatsoever.

The open area is undocumented; this can happen when a large tree falls over in a windstorm and knocks down every other tree around it.



Here the drone is looking higher, so you can see hills not far away, and lots more rolling hills across the horizon. There seem to be lots of botan palms across the top end and left top area of the corozera, though we need a drone with higher resolution in the future.



Here, on a 4K 32-inch monitor I can see that the outside has more botan than the inside (or else the corozo there are small and not easily visible from the air).



Closer view. Botan come in many different heights; same with corozo
(but here not are giant height except far lower right corner).



In this area there are botan palms everywhere; many more than corozo palms. Soil scientist project in the future would be helpful: "why are there more Sabal palms in this area than Attalea palms?"



Lots of corozo; lots of botan; lots of diverse other tree species also.



Angle of the sun is perfect; exposure setting of the drone photographer and pilot, Haniel Lopez, is perfect. You see two giant corozo palms (middle and diagonal to the upper right). Plus endless mid-height corozo and widely scattered botan palms.



From straight above looking straight down. You see the dirt road that passes through this corozera. FLAAR requested that FYDEP put in this road so that Nakum could be inspected and rescued. Looters don't need a road; but to document the looting it helps to have a road and helps park rangers protect the area. So we initiated creating a national park here in the 1970's and pointed out that both Yaxha and Nakum deserved to be protected. We had not visited nor worked at Naranjo in these years since our focus was Lake Yaxha and sites nearby.

Would help to count how many botan palms (perhaps about 20); and how many corozo (perhaps about 50). With a 100-megapixel Phase One iXM aerial UAV camera, multi-spectral software, two interchangeable auto-focus lenses, and a DJI M600 drone to carry the camera (with one lens at a time), it should be possible to map each area and from multi-spectral analysis calculate how many of each species of tree is present here.



Looking straight down you can see the fresh leaves rising up from the giant corozo palms and the older leaves floating horizontally as they begin to wilt. The old leaves will then fall down onto the trunk and eventually fall off in a wind storm or simply rot off.



The tree with white branches tells you this view is above; in this further view you again notice that the botan palms are much much much thicker across the top and down left side and down right upper corner.



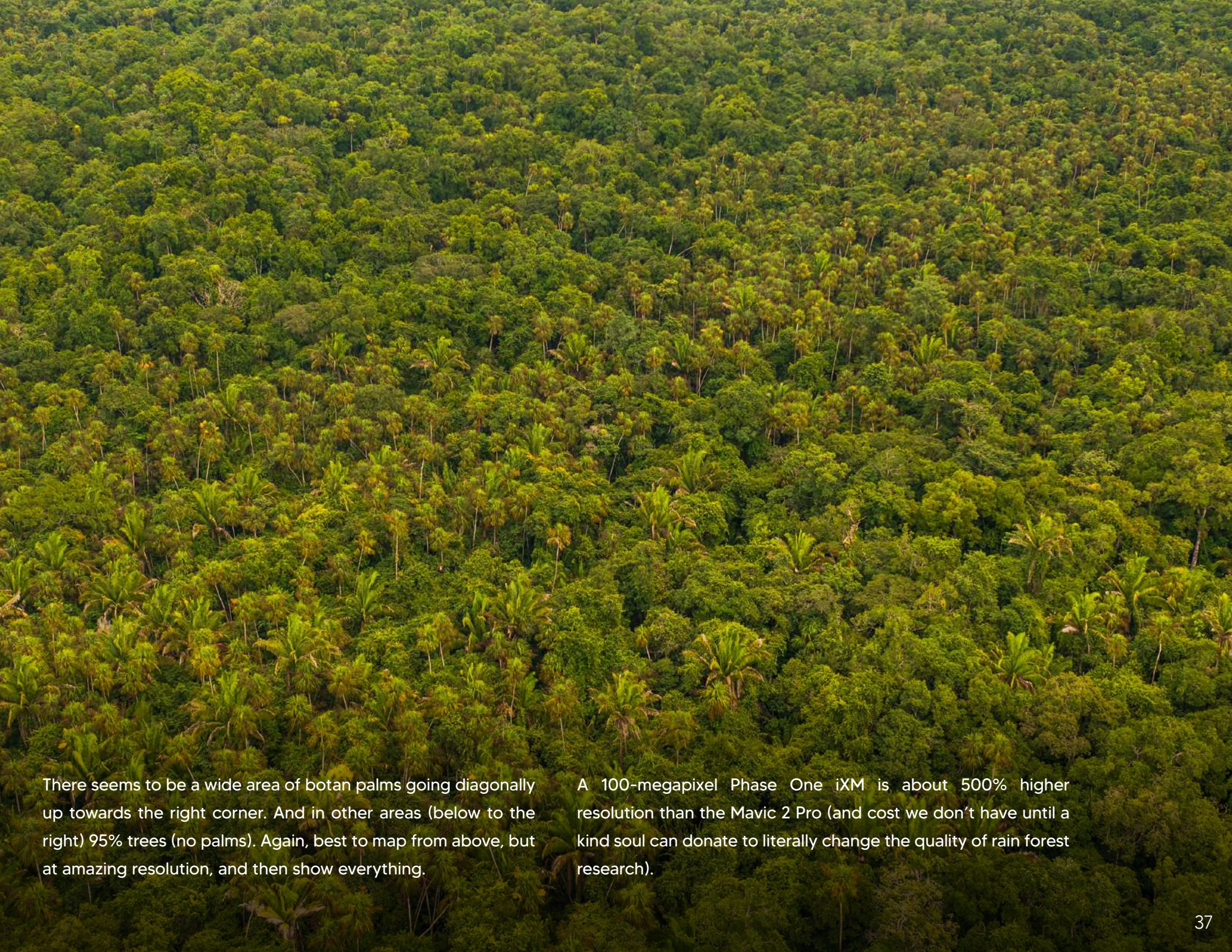
Far upper left and upper middle: “thousands of botan palms” yet below there is solid trees with only 1% botan (and no corozo). Then across the bottom 90% botan and 10% corozo. Again, need soil scientist to figure out why some areas have more botan; no botan; more corozo; not many corozo. But this need is inspired by these aerial photos.

This is why we go to the effort to drive 1,200 kilometers (600 up; 600 back to the office) and then work out in the field day after day. Then return to the office and work week after week to process the photos, write the reports, and have the design team prepare them for publication.



Lots of very tall corozo palms; dozens of botan palms but here not as tall as the corozo.

Across top middle to right, no more palms.

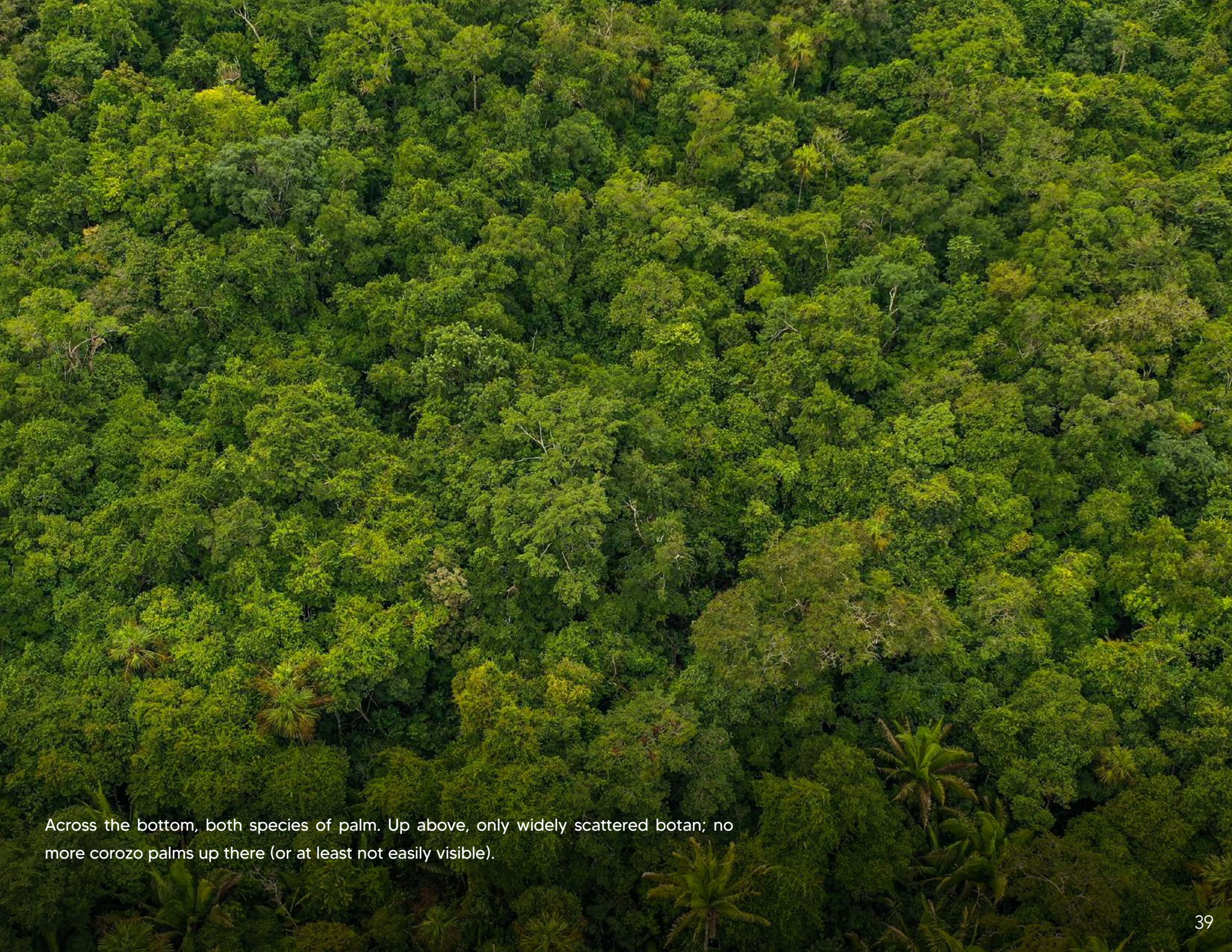


There seems to be a wide area of botan palms going diagonally up towards the right corner. And in other areas (below to the right) 95% trees (no palms). Again, best to map from above, but at amazing resolution, and then show everything.

A 100-megapixel Phase One iXM is about 500% higher resolution than the Mavic 2 Pro (and cost we don't have until a kind soul can donate to literally change the quality of rain forest research).



Same view: there seems to be a wide area of botan palms going diagonally up towards the right corner. And in other areas (below to the right) 95% trees (no palms). But now you can see Lake Yaxha in the distance.



Across the bottom, both species of palm. Up above, only widely scattered botan; no more corozo palms up there (or at least not easily visible).



Upper portion, no corozo but below lots of both species.



Looking straight down from above. Fortunately the corozo and botan palms are different size and shape so easy to tell.

I hope these photos encourage botanists in adjacent Chiapas, Tabasco, Campeche, Quintana Roo, and Belize to use a drone. I recommend you start with DJI Mavic 3 (do not go for the Mavic 3 Cine; stick with the regular DJI Mavic 3).

This is considered slightly better than the DJI Mavic 2 Pro that we have. It is not worth buying a lower-res drone in year 2022: Mavic 3 is the way to go (unless you have endless funds for the Phase One iXM system).

Plus, have a professional full-time pilot with plenty of experience.

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

Lots of other trees, most quite high, plus shrubs, vines and ground plants can be found in these corozeras.



Several guano palms with corozo palms at both sides. When the palm is only two to 4 or so meters high local people call it a guano. When the palm stands up over the forest it is called a botan.

Photo by Nicholas Hellmuth, iPhone 13 Pro Max.



Close-up of the leaves. (guano leaves).

Photo by Nicholas Hellmuth, iPhone 13 Pro Max.



The leaves stick out diagonally and lower ones are beginning to grow old and fall down.

Behind this guano palm is a tall corozo palm; its leaves stick up diagonally.



Guano palm surrounded by corozo palm. Corozera North of Yaxha, May 11, 2022



Fresh leaves sprouting out of the middle; aging leaf turning brown and beginning to bend over.



Fresh young leaves of Guano palm. Corozo palm leaves below and in the background.



At this height would be called a botan palm. Corozera North of Yaxha, May 11, 2022.

WHERE ELSE DO YOU FIND COROZO PALMS? (RIVER SIDES) AND WHAT GROWS IN OR NEARBY

We are documenting corozo palms in corozeras in flatland areas, surrounded by bajos. But corozo palms grow all over Peten, Belize and adjacent areas. In other words these palms are not limited to corozera habitats in flatlands.

PALMAE

Bactris sp. Jauade. Subin River, Lundell 2655. Common slender palm 2 to 5 meters high, forming undergrowth thickets on river bank. The species of the genus are viciously spiny.

Bactris sp. Jauade. Subin River, Lundell 2655A. Common along with the former species in the same habitat.

Cryosophila argentea Bartlett. Akuum, Escoba. Monte Santa Teresa, Subin River, Lundell 2669. Common thorny palm, growing 3 to 8 meters high in old upland forest. The species characterizes certain swampy habitats.

Geonoma mexicana Liebm. Moxan, Cambo, Uatopil. Monte Santa Teresa, Subin River, Lundell 2691. Somewhat common palm, growing 2 to 3 meters high in old upland forest.

Orbignya cohune (Mart.) Dahlgren. Tutz, Corozo. Subin River. Giant palm, forming immense groves along the river on the higher banks.

Sabal sp. Botan. Monte Santa Teresa, Subin River. A palm ranging in height from 5 to 15 meters; common in old upland forest.

Scheelea lundellii Bartlett. Kantutz, Corozo. Subin River. Giant palm, common along with *Orbignya cohune* in groves on the higher banks of the river.

(Lundell 1937: 196) *Scheelea lundellii* Bartlett is a synonym of *Attalea rostrata* Oerst.

If you include studies of palms of Belize you would have lots more information, but the present FLAAR Report is just an introduction to corozeras, corozal palm, and botan palms between Yaxha and Nakum, within the Parque Nacional Yaxha, Nakum and Naranjo. When we have aerial photos of the corozeras near Naranjo Sa'al and elsewhere in Peten, we will also do more citation of corozal areas of Belize. Also need to learn about Quintana Roo, Campeche, Tabasco, and Chiapas (the areas that are adjacent to Peten). In the meantime, we cite Cyrus Lundell on corozales.

Corozales

The corozo palm, *Orbignya cohune*, grows in great groves giving the association known as the corozal. The palm with its towering straight trunk crowned with huge pinnate leaves ascending in great arches is a tree of unsurpassed beauty and gracefulness. Another palm of similar appearance, *Scheelea lundellii*. (See p. 142), may be of first importance in the association. The subdominants are great trees, *Achras zapota*, *Swietenia macrophylla*, and species of *Ficus*.

Corozales are found along river banks, in valleys, and occasionally on hill sides, habitats where the soils are deep and fairly well drained. The association is one of the best defined of any of the uplands. The exact relationship of the corozal to the climax associations has not been definitely determined. I am of the opinion that the corozal represents an intermediate stage because of its requirements of deep, moist, fairly drained soils, edaphic conditions which are limited chiefly to gentle hill slopes, valleys, and stream banks

(Lundell 1937: 32)

At Polol and in Monte Chimah (fig. 1) corozales, groves of the giant magnificent palms, the kantutz, *Scheelea lundellii*, and tutz or corozo, *Orbignya cohune*, are present. Corozales are generally characteristic of river banks. In the flatland high forest at Polol, where the corozo palms are absent, the giant uapake, *Dialium guianense*, appears to be the dominant tree, giving the uapakal.

(Lundell 1937: 142)

Orbignya cohune (Mart.) Dahlgren. Tutz, Corozo. La Libertad, Lundell 34140, 3592. Giant palm; common in hill slope, limestone valley, and flatland forest. Extensive groves occur in Monte Hiltun, Monte Chimah, and at Polol.

Sabal mexicana Mart. Bonxaan, Huano de sombrero. La Libertad, Lundell 3073. Cultivated to a limited extent; the young leaves are used to make hats. *Scheelea lundellii* Bartlett. Kantutz, Corozo. La Libertad, Lundell 3752, type collection. A giant magnificent palm not unlike *Orbignya cohune* in general appearance, growing in the corozales at Polol with the latter species.

(Lundell 1937: 161) This is nowhere near a river bank; so corozo palm grows in many ecosystems

More documentation of the Monte Hilton area (which I estimate is near Poptun since there is a "Hotel Hilton" in the town of Poptun.

Second-story trees ranging in height from 15 to 30 meters include *Alseis yucatanensis*, *Sickingia salvadorensis*, *Lucuma campechiana*, and last, but not of least importance, the two palms, *Orbignya cohune* and *Scheelea lundellii*. The *Orbignya* forms groves in Monte Hiltun, Monte Chimah, and Monte Polol. In Monte Polol corozales, the *Scheelea* is prominent. The corozal association is quite permanent, and where it occurs it represents one of the most stable phases of the vegetation of the limestone valleys. Corozales are also found on the deep clay flatlands (p. 142).

(Lundell 1937: 153)

Orbignya cohune (Mart.) Dahlgren. Corozo. Giant magnificent palm 5 to 30 meters high; common in most valleys and on stream banks. The rich oily kernels are eaten raw or boiled to extract the oil. *Sabal mexicana* Mart. Huano de sombrero. San Andres. Tree with thick trunk, 4 to 8 meters, high; planted in villages. I have never encountered the species growing wild in the Yucatan Peninsula. The young leaves are used extensively by the Indians for making hats.

Sabal sp. (*S. morrisiana* Bartlett, ined.) Botan. Uaxactun, Bartlett 12284. Graceful, slender palm 4 to 5 meters high; common in marginal areas of swamp forest (botanal), around aguadas, and in climax forest. In the swamp it towers over all the other vegetation, while in the climax forest it belongs to the middle tree tier reaching a maximum height of about 25 meters. The leaves of this species are prized above all others for thatching, and the trees is generally saved when milpa clearings are made in climax forest.

(Lundell 1937: 53)

At Polol and in Monte Chimah (fig. 1) corozales, groves of the giant magnificent palms, the kantutz, *Scheelea lundellii*, and tutz or corozo, *Orbignya cohune*, are present. Corozales are generally characteristic of river banks. In the flatland high forest at Polol, where the corozo palms are absent, the giant uapake, *Dialium guianense*, appears to be the dominant tree, giving the uapakal.

(Lundell 1937: 142)

Scheelea lundellii is a synonym for *Attalea rostrata*. But... *Attalea rostrata* is listed by Neotropical Flora as primarily being collected in Colombia, Ecuador, Panama, Costa Rica, Honduras. The specimens for Izabal, Guatemala are listed as *Attalea butyracea*, as though *Attalea rostrata* was a synonym for *Attalea butyracea*. So I suggest that Lundell's plant collections need to be restudied (and recollected). And the mish-mash of palm names be resolved.

Attalea cohune is the only corozo listed for Belize in year 2000 (Balick, Nee and Atha 2000: 194). *Attalea rostrata* is not listed for Mexico; but *Attalea butyracea* is all over the Maya lowlands (Villasenor 2016: 616). *Attalea butyracea* is listed primarily for Colombia and Peru (Neotropical Flora database); also in Ecuador, Panama, Costa Rica. Specimens in Guatemala, collected by Steyermark in 1940, need to be restudied: there are corozo plants throughout the Municipio de Livingston available to be collected and identified.

Attalea rostrata Oerst.

Attalea liebmannii (Becc.) Zona

Attalea lundellii (Bartlett) Zona

Cocos regia Liebm.

Scheelea costaricensis Burret

Scheelea liebmannii Becc.

Scheelea lundellii Bartlett

Scheelea preussii Burret

Scheelea rostrata (Oerst.) Burret

Scheelea zonensis L.H.Bailey

According to ethnobotanist Cyrus Lundell, *Scheelea palms* were prominent in limestone valleys. Polol is to the west of La Libertad (west of the highway from Lake Peten Itza to Sayaxche). I did not see Monte Chimah shown on Lundell's map (1937, Fig. 1, facing page 1).

Monte Hiltun I estimate is near Poptun (because there is a hotel and restaurant of that name around Poptun). Although these areas are outside the Reserva de la Biosfera Maya, they are both worth checking to see if corozal areas still survive. The karst area around Poptun is totally different than the RBM, PNYNN areas of Peten. The savannas around Polol are different (less moisture) than the savannas in PNYNN, PNLT and the middle of Municipio San Jose. More pine around Poptun.

OTHER PLANTS IN THIS COROZERA-BOTANAL NORTH OF YAXHA: *PHILODENDRON RADIATUM*.

The Araceae *Philodendron radiatum* grows up trees in many different ecosystems of Guatemala. They really like to live in leaf capture material up and down the trunks (stems) of mature corozo palms. The plant here seems to have fallen to the ground (they are usually on a tree or palm trunk, not on the ground).



Philodendron radiatum in the Corozera North of Yaxha, May 11, 2022.

Photo by Nicholas Hellmuth, iPhone 13 Pro Max, in RAW format (DNG) to achieve high resolution.
This feature is available on the iPhone 13 Pro Max if you select it in the settings.



Two leaves of *Philodendron radiatum* in the Corozera North of Yaxha, May 11, 2022.



Typical giant leaf of *Philodendron radiatum* in the Corozera North of Yaxha, May 11, 2022. If the leaves have holes in them the plant is *Monstera deliciosa*, but that is native to other parts of Guatemala. But the holes here are probably from leaf-cutting ants or butterfly larvae; the plant is *Philodendron radiatum*.



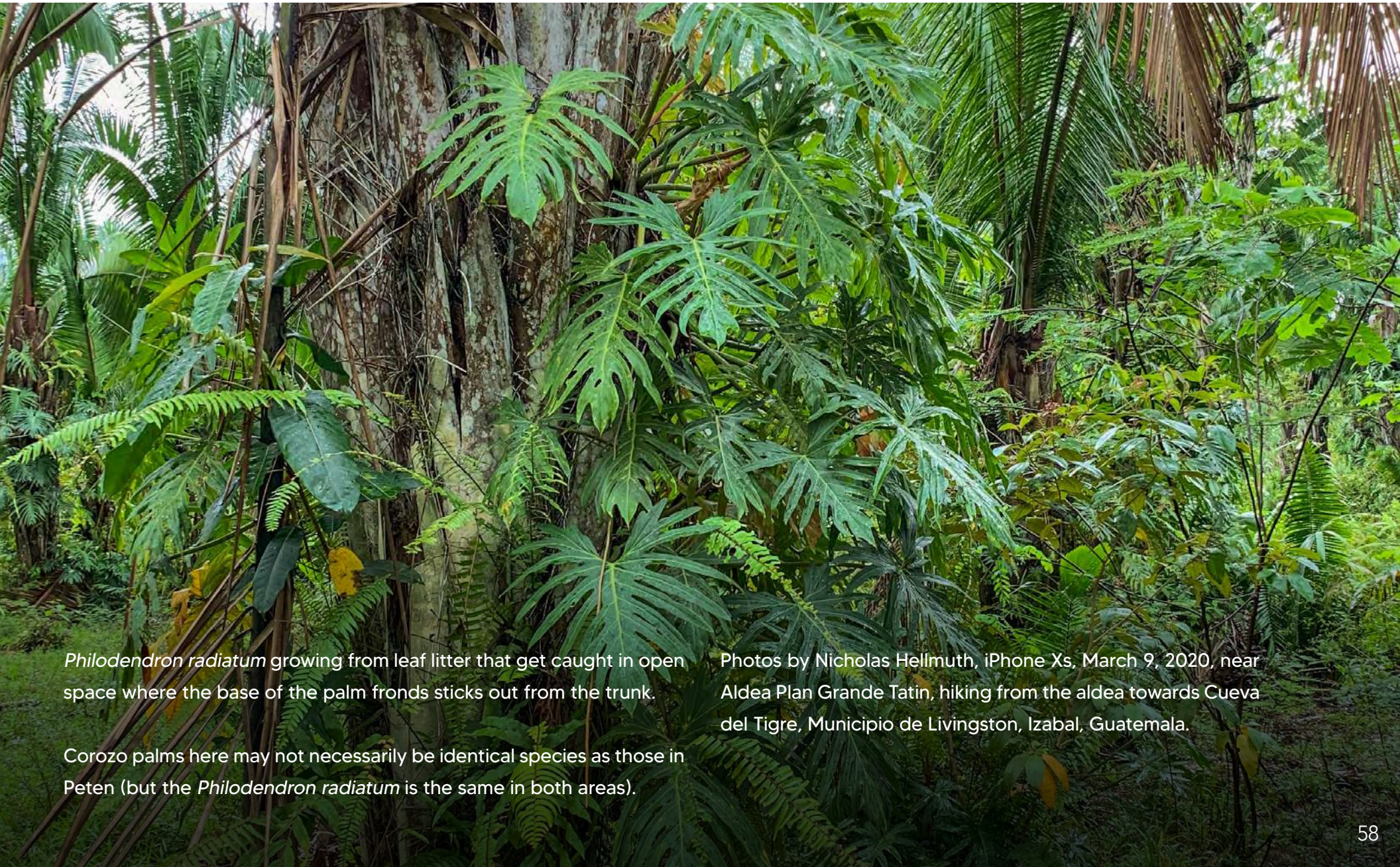
Philodendron radiatum in the Corozera North of Yaxha, May 11, 2022.



This is how a *Philodendron radiatum* is normally seen, climbing up a tree or a palm. This is from the other corozera, Corozera Ceiba, south of Nakum, Parque Nacional Yaxha, Nakum and Naranjo (PNYNN).

YOU CAN FIND *PHILODENDRON RADIATUM* GROWING UP COROZO TREES THROUGHOUT IZABAL

During our one-week-per-month field trips over 17 months project (2020-2021) in the east half of Municipio de Livingston, Izabal, Guatemala we found hundreds of corozo palms with *Philodendron radiatum* growing up their trunks. Here are a few examples. Lots of other plants (ferns, etc.) also flourish in the leaf litter caught on the stems (trunks) of these giant palms, but we show here just the Araceae.



Philodendron radiatum growing from leaf litter that get caught in open space where the base of the palm fronds sticks out from the trunk.

Corozo palms here may not necessarily be identical species as those in Peten (but the *Philodendron radiatum* is the same in both areas).

Photos by Nicholas Hellmuth, iPhone Xs, March 9, 2020, near Aldea Plan Grande Tatin, hiking from the aldea towards Cueva del Tigre, Municipio de Livingston, Izabal, Guatemala.



Philodendron radiatum on corozo palms, near Aldea Plan Grande Tatin.

OTHER PLANTS IN THIS COROZERA-BOTANAL NORTH OF YAXHA: SUBIN, BULLHORN ACACIA



Bullhorn acacia, known locally as subin, likes to grow where moisture and sun are available. There are several species with the same name.

Corozera North of Yaxha, PNYNN, photo by Nicholas Hellmuth, iPhone 13 Pro Max, May 11, 2022.



At least one end of each spine has a hole chewed into it by the ants that live inside. These ants have a symbiotic relationship with the *Acacia*. The *Acacia* provides safe space (and the thorns protect the area) and the ants rush out to attack anyone who makes the mistake to brush up against this bush.

Corozera North of Yaxha, PNYNN, photo by Nicholas Hellmuth, iPhone 13 Pro Max, May 11, 2022.



The thorns are red, to remind you of their presence so you don't come near.

Corozera North of Yaxha, PNYNN, photo by Nicholas Hellmuth, iPhone 13 Pro Max, May 11, 2022.

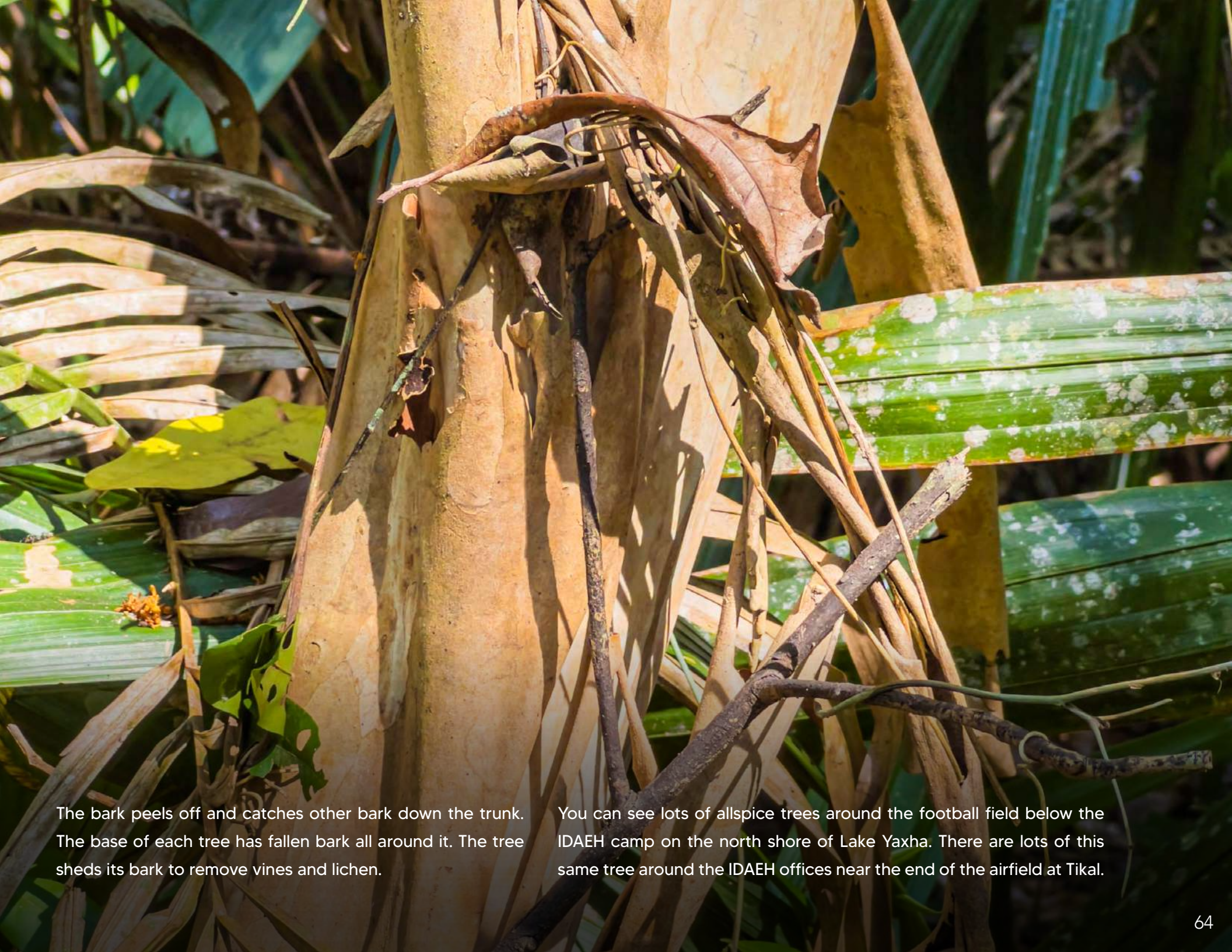
OTHER PLANTS IN THIS COROZERA-BOTANAL NORTH OF YAXHA: PIMIENTA GORDA, ALLSPICE TREE

You can easily identify the *Pimenta dioica* tree by the bark peeling off its trunk. This is the allspice tree, pimienta gorda in Spanish. These trees grow in regular forests; they do not require bajo soil. So this bajo is very different from the bajos we encounter in the far southeast part of Parque Nacional Laguna del Tigre (PNLT) as we hike through the bajos for hours, to reach the seasonally inundated savannas that we are studying.



Would be interesting to learn whether *Pimenta dioica* trees also grow in tinal bajos. These bajos need REA (Rapid Ecological Assessment) coverage (so more than just archaeological research); need to have list of every plant growing in each part of each bajo. This is a good project for other research institutes or university professors. So we can show them where the bajos are and how they differ.

Corozera North of Yaxha, PNYNN, photo by Nicholas Hellmuth, iPhone 13 Pro Max, May 11, 2022.



The bark peels off and catches other bark down the trunk. The base of each tree has fallen bark all around it. The tree sheds its bark to remove vines and lichen.

You can see lots of allspice trees around the football field below the IDAEH camp on the north shore of Lake Yaxha. There are lots of this same tree around the IDAEH offices near the end of the airfield at Tikal.



Pimenta dioica tree trunk, Corozera North of Yaxha, PNYNN, photo by Nicholas Hellmuth, iPhone 13 Pro Max, May 11, 2022.

ARE COROZERAS REGISTERED FOR PARQUE NACIONAL TIKAL?

There is an archaeological site named El Corozal (Vidal, Teufel and Fialko 1996) about 5 kilometers to the east of Tikal (so towards PNYNN). Need to check whether El Corozal is inside the edge of which national park.

ARE ANY PARTS OF *ATTALEA COHUNE* EDIBLE?

Orbignya cohune is the name used for corozo palm in the 1930's-1960's. Today that is a synonym for *Attalea cohune*:

From the seed of the corozo palm, *Orbignya cohune*, the present Maya of the Santa Cruz country obtain oil for cooking, and the ancient Maya may have done the same. : (Lundell1937: 11)

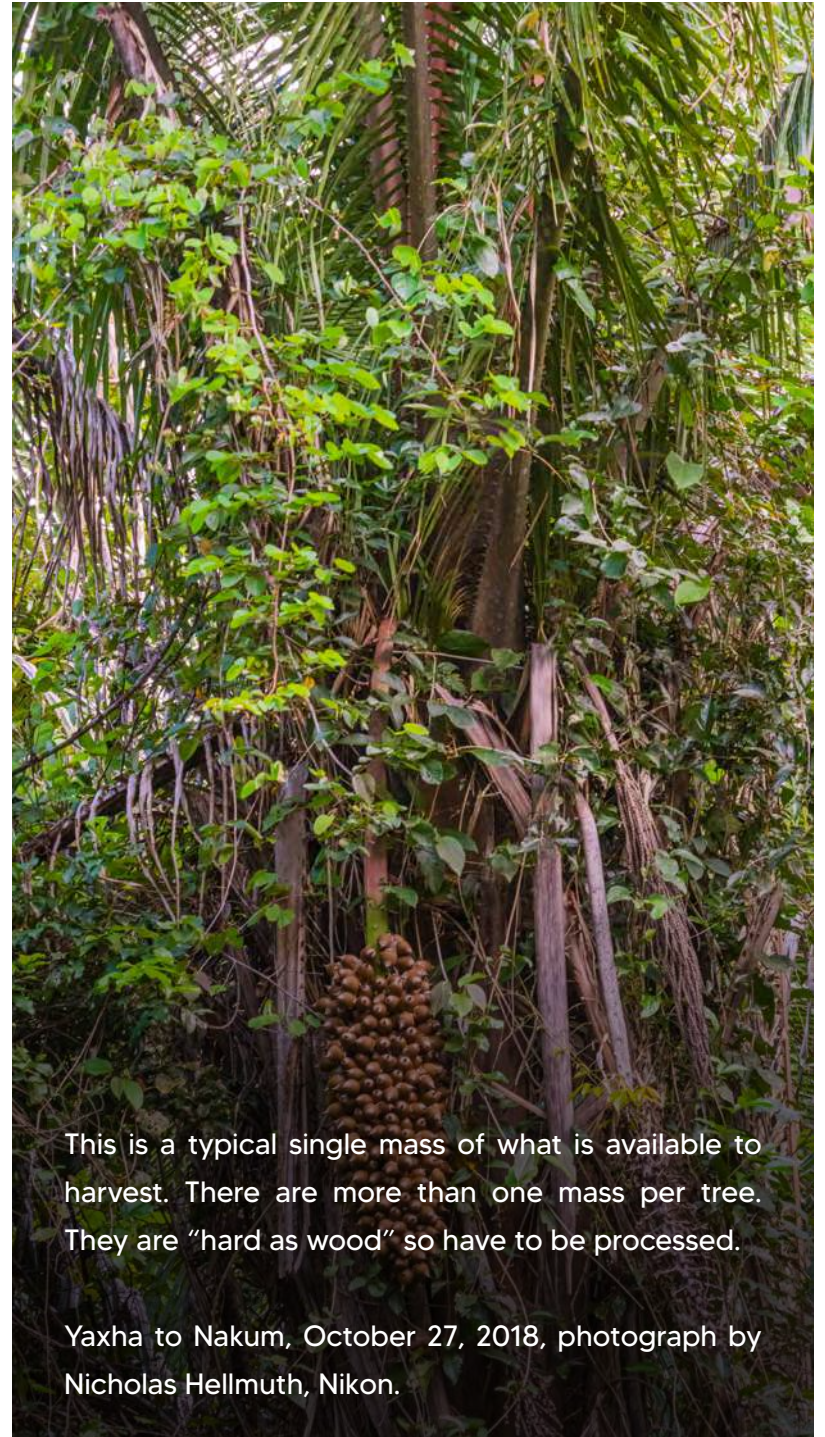
Balick, Nee and Atha provide a range of uses for *Attalea cohune* (2000: 194):

Loc Use: MED, FOOD, OIL, FUEL, BEV, CNST, PRD. –

Reg Use: PRD, FOOD, FUEL, MED, CNST, BEV.

That's a lot of utilitarian (FUEL, CNST, PRD) and edible (FOOD, OIL, BEV) plus medicinal potential. Combine these uses with those of the guano or botan palm adjacent to the corozo: *Sabal yapa*: Loc Use: FOOD, PRD, CNST. – Reg Use: MED, CNST, FIBR.

Then add the uses of all the vines, trees and herbs that also grow in the same corozeras. Plus the Classic Maya would have taken advantage of the potential of the soil here to plant lots more.



This is a typical single mass of what is available to harvest. There are more than one mass per tree. They are "hard as wood" so have to be processed.

Yaxha to Nakum, October 27, 2018, photograph by Nicholas Hellmuth, Nikon.

CONCLUDING DISCUSSION AND SUMMARY ON *ATTALEA COHUNE* AND THE COROZERA NORTH OF YAXHA

One goal of our field work in PNYNN and elsewhere in the RBM is to assist local park administrators by FLAAR providing documentation and photographs that can be added to upcoming Plan Maestro reports.

In each corozera over 60% is corozo palm but there are enough botan palms to make them noticeable. Even though this ecosystem has lots of these two species of palm there are also diverse species of trees growing everywhere: and due to the height of the palms and the trees I would not call this a low forest bajo.

Dozens of botanical reports mention that a corozera area is significantly better place to plant maize. This raises the question, "how did the Preclassic and Classic Maya use these healthy soil areas? Would be a great PhD dissertation in ecology, soil science, botany, or ethnobotany to have a map of every corozal in the Peten and adjacent Belize. If corozal areas are also present in the drier adjacent Campeche and wetter adjacent area of Tabasco these should also be included.

Solid corozo palm creates the area known as a corozera, local Peten word for corozal (meaning lots of corozo palms in one area).

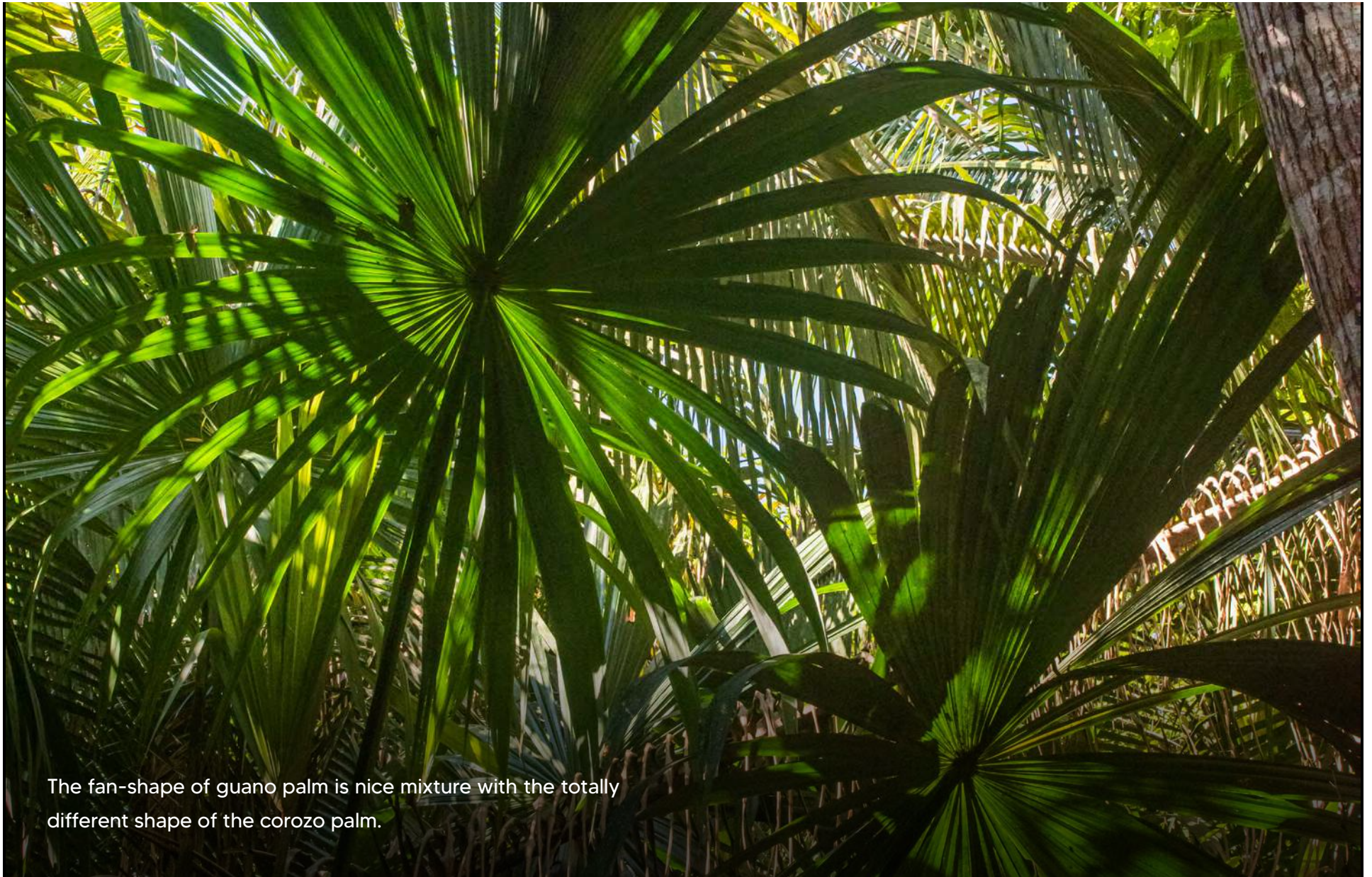
Corozera North of Yaxha. No botan palms visible here.

Photo by Nicholas Hellmuth, Nikon, Feb. 17, 2019.



APPENDIX A

Would be educational to have Fine Art Giclee Photos of Corozo and Guano Palms for a “Botanical Art Exhibit”



The fan-shape of guano palm is nice mixture with the totally different shape of the corozo palm.



The variable arching and reflected light makes a notable scene. Pure blue sky above helps.



These long and wide leaves of corozo palm are waiting for you to photograph them.



Usually I prefer more sunlight, but I also like dark vs bright light in same image.

Fine art style photo by Nicholas Hellmuth, Corozerá North of Yaxhá, Parque Nacional Yaxhá, Nakum and Naranjo (PNYNN), RBM, Peten, Guatemala. Nikon camera, NEF (Nikon RAW), February 17, 2019.



I like bright fresh green plants growing up to survive. But I also like the color and pattern of dead or dying parts of plants.

When the leaves wilt, they eventually fall over, but do not fall to the ground (since their base is still stuck to the trunk). So the bottom part of the trunk of a corozo palm has a mass of long dead leaves.



As you hike into the palm forest you see leaves of every life stage.



Color of the dead leaves varies depending on whether the sun is direct or not; here it is direct. These leaves have begun to fall off the trunk, towards the ground.

Pure blue sky behind.

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Note: since the present edition is a work-in-progress
this bibliography also is a work-in-progress

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Very helpful and nice collaboration with local Itza' Maya
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HELPFUL WEB SITES FOR ANY AND ALL PLANTS

There are several web sites that are helpful even though not of a university or botanical garden or government institute.

However most popular web sites are copy-and-paste (a polite way of saying that their authors do not work out in the field, or even in a botanical garden). Many of these web sites are click bait (they make money when you buy stuff in the advertisements that are all along the sides and in wide banners also. So we prefer to focus on web sites that have reliable information.

<https://serv.biokic.asu.edu/neotrop/plantae/>

Neotropical Flora data base. To start your search click on this page:

<https://serv.biokic.asu.edu/neotrop/plantae/collections/harvestparams.php>

<http://legacy.tropicos.org/NameSearch.aspx?projectid=3>

This is the main SEARCH page.

<https://plantidtools.fieldmuseum.org/pt/rrc/5582>

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

<https://fieldguides.fieldmuseum.org/guides?category=37>

These field guides are very helpful. Put in the Country (Guatemala) and you get eight photo albums.

<http://enciclovida.mx>

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

www.kew.org/science/tropamerica/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).

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.

This report can be cited in your preferred style. Here is the basic information:

HELLMUTH, Nicholas

Solid Corozo Palms around Botan Palms, Corozera with Botanal north of Yaxha, Parque Nacional Yaxha, Nakum and Naranjo Reserva de la Biosfera Maya (RBM) Peten, Guatemala. FLAAR Mesoamerica.

BASE CAMP ASSISTANCE IN PNYNN

We thank Biologist Lorena Lobos and both co-administrators of PNYNN (Arq. Jose Leonel Ziesse (IDAEH) and Lic. Jorge Mario Vazquez (CONAP) for providing a place to stay for the photographers, biologists, and assistants of the FLAAR Mesoamerica team of flora and fauna during the 1-week-a-month field trips August 2018 through July 2019.

In turn FLAAR purchased and donated a cooking stove when the original one no longer functioned, plus we have photographed and documented many tree and insect species that we found around this camp.

BASE CAMP ASSISTANCE IN PARQUE NACIONAL TIKAL

While doing field work in the Tikal national park about a decade ago we appreciate the house provided to us by the park administration. We also thank the Solis family, owners of the Jaguar Inn, for providing a place to stay when park facilities had other occupants. We also thank the Solis family for food in their Jaguar Inn restaurant.

ECOLOGGE EL SOMBRERO

I thank Gabriella Moretti, owner of Ecolodge El Sombrero, for providing hotel room and meals while we have been doing field work at Parque Nacional Yaxha, Nakum and Naranjo. We also appreciate the hospitality of her sons Sebastian de la Hoz and Juan Carlo de la Hoz. Every workday is exhausting because we are carrying and then using very heavy cameras, super-telephoto lenses, sturdy tripods, large gimbals or ball tripod heads. Thus it is crucial for my health to be able to rest and totally recuperate every night in order to be ready for the following day of botanical and zoological adventures in Parque Nacional Yaxha, Nakum and Naranjo.

Equally crucial is having a place to charge the batteries of the computers, plus all the cameras, and recharge cell phones. Solar power is great, but it lasts only an hour, or less, if you plug in multiple computers and cameras and flash batteries to charge. So a place with enough electricity to charge the entire mass of essential field work equipment is essential and thus very much appreciated.

In order to post photographs on botanical and zoological websites, you can't do this if there is either no Internet or weak Internet. Thus it is very helpful that when we are provided rooms and meals, that Internet is also provided by the Ecolodge El Sombrero.

Contact Info: +502 5460 2934, VentasElSombrero@gmail.com or WhatsApp. www.elsombreroecolodge.com/en-us

We sincerely appreciate the storage space of Ingeniero Forestal, Sergio Balam, for Santa Elena/San Benito area of Peten to store our camping equipment when we are finished with each week-long field trip. Then all the tents and sleeping equipment, kitchen equipment, supplies, and other field trip equipment is ready-to-go on the next field trip. Thank you Sergio.

PERMISSIONS

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: either

www.maya-ethnobotany.org or
www.maya-ethnozology.org or
www.maya-archaeology.org or
www.digital-photography.org or
www.FLAAR-Mesoamerica.org.

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 web site for their students to download at no cost. And you do not need to write and ask permission; but we do appreciate when you include a link back to one of our web sites.

Any web site 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 when you include a link back to one of our web sites.

CECON, CONAP, FUNDAECO, INGUAT, ARCAS, IDAEH, Municipio de Livingston, etc. 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, and other Guatemalan universities and high schools, and schools, are welcome to post our reports, at no cost.

IF YOU WISH OUR FLORA AND/OR 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, museums, alumni clubs, etc.

He also writes cartoon books on plants and animals of Guatemala so gives presentations to primary school, high schools, etc. www.MayanToons.org shows our educational material for children.

In today's COVID era, we present via ZOOM, Google Meet or comparable platforms. This way there are no costs for airfare, airport shuttle, hotel, or meals. But it is appreciated when a donation can be provided before the lecture presentation to assist our decades of research.

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 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 of 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 our office expenses for all the cataloging, processing, and organization of the photos and the field trip data.

FOR YOUR 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.

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.

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 María Setina is the office manager, overseeing all the diverse projects around the world (including FLAAR-REPORTS research on advanced wide-format digital inkjet printers, a worldwide project for over 20 years). We also utilize the inkjet prints to produce educational banners to donate to schools.

Vivian Díaz environmental engineer, 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). Also coordinates activities at MayanToons, division where educational material for kids is prepared.

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 nowadays is getting involved in the coordination and development of Flora and Fauna projects. She is studying environmental engineer from Universidad Rafael Landívar.

Andrea de la Paz is a designer who helps prepare the master-plan for aspects of our publications. She is our editorial art director.

Norma Estefany Cho Cu helps with preparing the camera equipment for each field trip and helps in the office (and on field trips) as cook.

Byron Pacay handles GPS mapping of where we hike or go in the lancha (boat) each field trip day. He also lists where we stop to take photos and what each one of us is photographing and then has that tabulation ready each night.

Jaqueline González 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).

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

María Alejandra Gutiérrez 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.

Juan Carlos Hernández 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 Núñez 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 Avilés is an illustrator for MayanToons, the division in charge of educational materials for schools, especially the Q'eqchi' Mayan schools in Alta Verapaz, Q'eqchi' and Petén Itzá Maya in Petén, and the Q'eqchi' Mayan and Garifuna schools in the municipality of Livingston, Izabal.

Josefina Sequen is an 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.

Heidy Alejandra Galindo Setina joined our design team in August 2020. She likes photography, drawing, painting, and design.

Maria José Rabanales she is part of the team for editing photographic reports and educational material of Flora and Fauna since September 2020. She works together with others of the team to prepare the finished pdf editions of the material of the Yaxha, Nakum and Naranjo Project.

Alejandra Valenzuela, biology student is now part of Flora y Fauna's photographic report and educational material editing team since September 2020.

Alexander Gudiel designer who join the editorial design team on December 2020. He will combine the text, pictures and maps into the FLAAR Mesoamerica editorial criteria.

Cristina Ríos designer student who join the editorial design team on December 2020. She will combine the text, pictures and maps into the FLAAR Mesoamerica editorial criteria.

Carlos Marroquín is a USAC graphic design student who volunteered to do his professional practice with the Editorial Design Team. We are very grateful with people like him who join our team and bring his knowledge and work.

Sergio Jerez 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).

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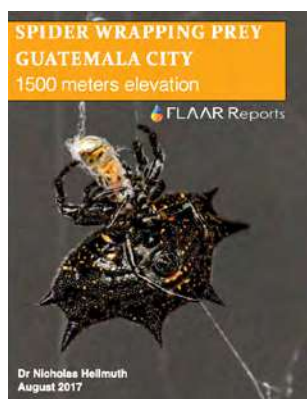
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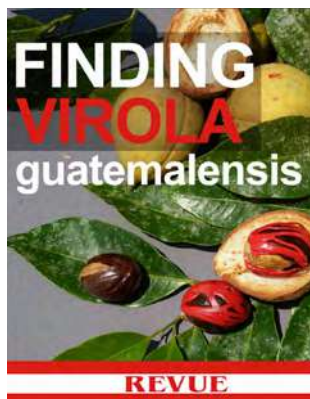
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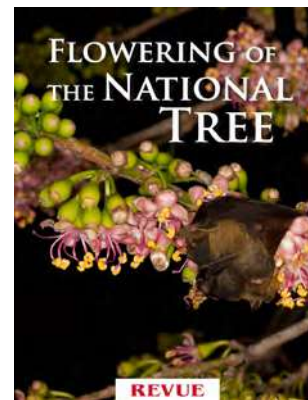
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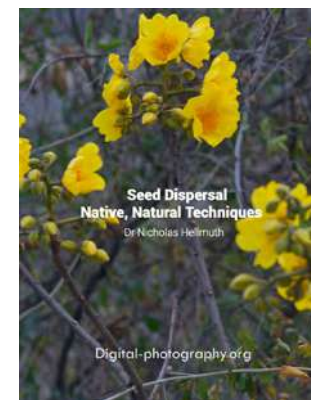
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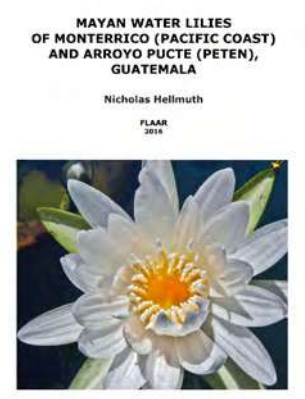
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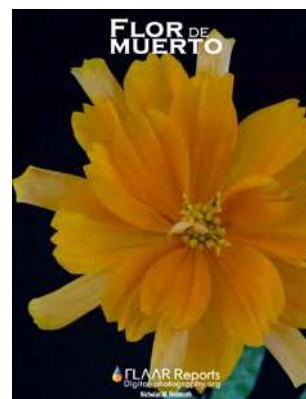
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