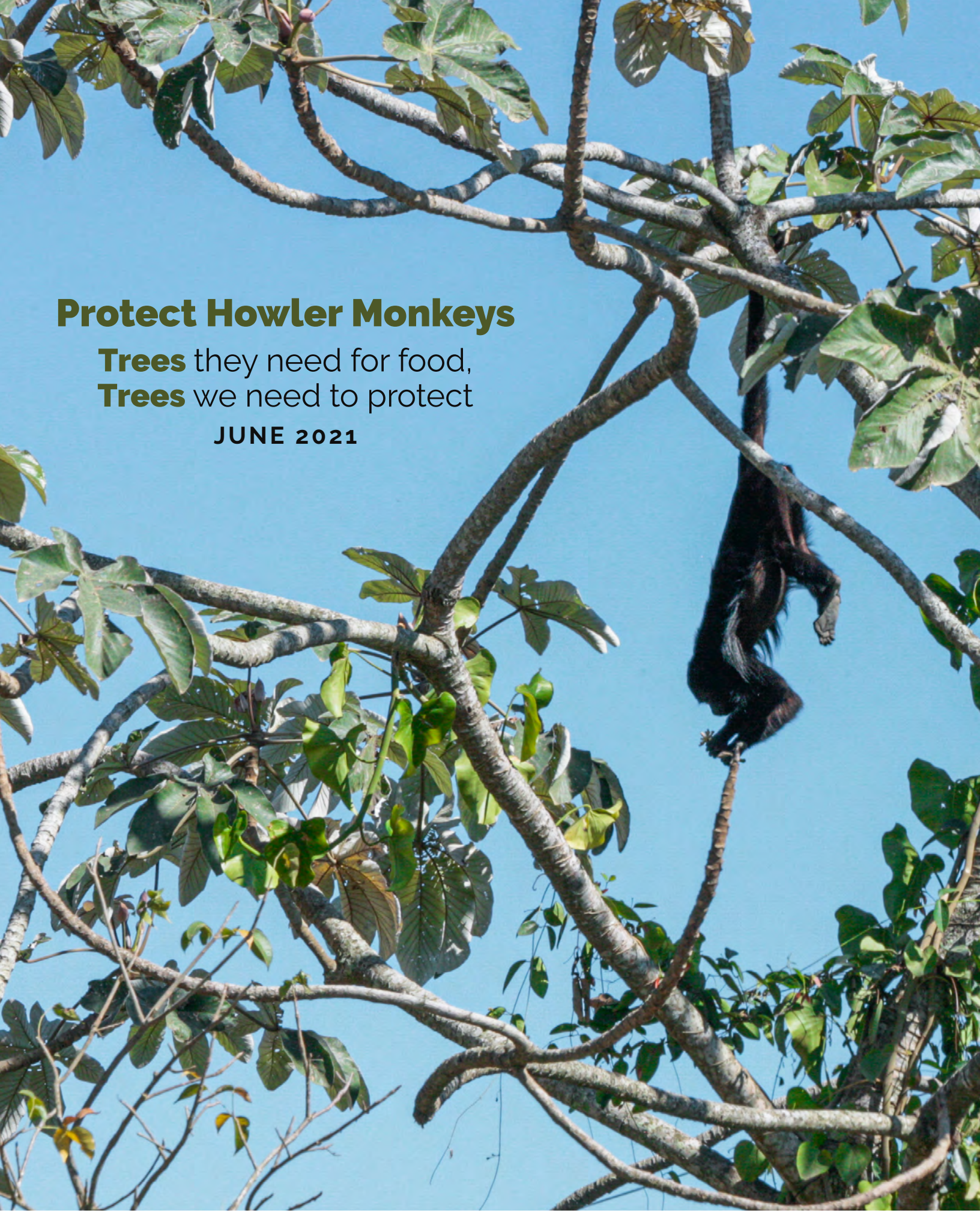
Protect Howler Monkeys

Trees they need for food, **Trees** we need to protect

NICHOLAS **HELLMUTH**

FLAAR
MESOAMÉRICA



Protect Howler Monkeys

Trees they need for food,
Trees we need to protect

JUNE 2021

FLAAR (USA) AND FLAAR MESOAMERICA (GUATEMALA)

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.

AUTHOR
Nicholas Hellmuth

BOTANICAL & ZOOLOGICAL INFORMATION COMPILER
Nicholas Hellmuth
Victor Mendoza

BIBLIOGRAPHY TEAM
Nicholas Hellmuth
Vivian Hurtado

BIBLIOGRAPHY TEAM
Nicholas Hellmuth
Senaida Ba Mucu

EDITOR
Vivian Díaz

PHOTOGRAPHERS
Nicholas Hellmuth
Roxana Leal
David Arivillaga
Vivian Diaz
Erick Flores
Boris Llamas
Melanny Quiñónez

PHOTOGRAPHY ASSISTANTS FOR MANY YEARS WHILE PHOTOGRAPHING MONKEYS
Senaida Ba Mucu
Gaby Cabnal

MANAGER OF DESIGN AND LAYOUT
Andrea Sánchez Díaz

LAYOUT OF THIS ENGLISH EDITION
Alexander Gudiel

PHOTO FROM FRONT COVER
This black howler monkey,
Alouatta pigra, is busy at work eating leaves. FLAAR Photo Archive.
Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Feb. 11, 2018, Río Polochic, Alta Verapaz.
Camera: Nikon D5. Lens: Nikon AF-S NIKKOR 600mm FL ED VR. Settings: 1/500 sec; f/7.1; ISO 1,000.

PHOTO FROM TITLE PAGE
This Black howler monkey,
Alouatta pigra, clearly wants to eat this part of the *Cecropia peltata* tree (Guarumo). It is willing to use only its tail so it can reach these buds or fruits. If we had an 800mm lens for the Canon EOS 1D X Mark II camera we could have taken a close-up of the part of the Guarumo tree that it is dedicated to eating. If we had a Broncolor Siros 800 L telescopic flash we could illuminate the part of the tree that the howler is about to enjoy.
Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Feb. 11, 2018, Río Polochic, Alta Verapaz.
Camera: Nikon D5. Lens: Nikon AF-S NIKKOR 600mm FL ED VR. Settings: 1/500 sec; f/7.1; ISO 1,000.

CONTENTS

FLAAR MESOAMÉRICA

FLAAR

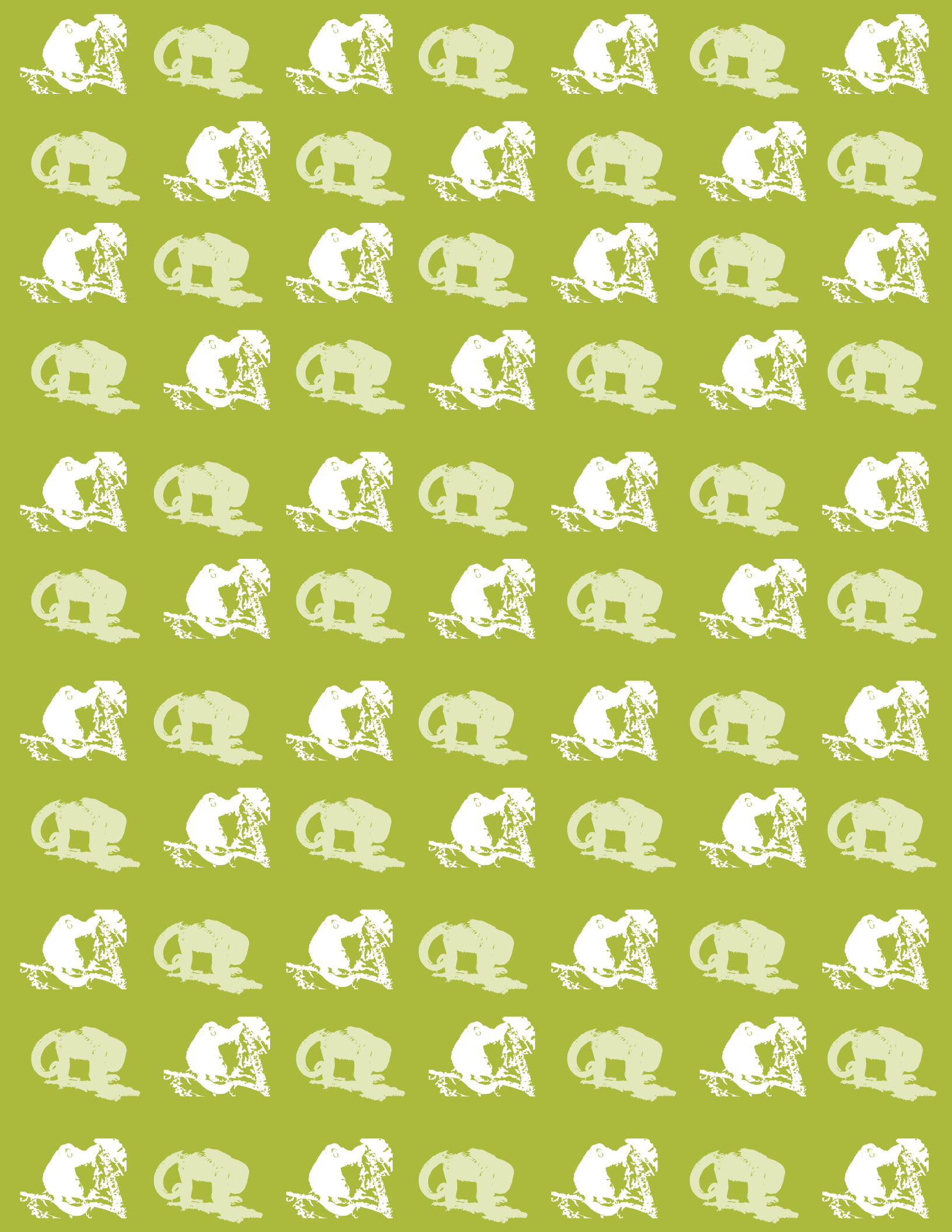


Photo credits on page #11

Photo credits on page #11

Photo credits on page #11

For a species to survive it needs food and a habitat that it can handle

A howler monkey consumes primarily **leaves of trees** (and flower buds, flowers, fruits and fresh stems, of trees). These monkeys do not often eat on the ground; they feed primarily up in the treetops. So to enable howler monkeys to survive it is essential to protect the local trees.

We have seen spider monkeys hiking around on the ground (to reach water to drink). A howler monkey gets moisture from the leaves it eats plus water is often up in the trees; rain caught in troughs of arboreal plants, etc. It would be rare to see a howler monkey wandering around on the ground (wow, what a photographic opportunity). So if there is cattle pasture, a howler monkey will not often tend to hike across this open area. It is helpful to maintain a corridor (of trees) so that howler monkeys can cross from one area to another.

The need for a howler monkey to move to different areas is because each month different trees either lose their leaves or if the leaves fell in a previous season, then leaves are growing back (so fresh for the monkey to eat them). And obviously in some months there are flowers or fruits in one area that are on trees not growing in another areas.

The fastest way to have a corridor for the howler monkey (to move from one area to another) is to plant the trees that a howler absolutely loves and a tree that grows very fast: namely a row of guarumo trees *(Cecropia peltata)*. Plus, surely we can find other trees that can grow quickly and provide a corridor for howler monkeys to cross fields more easily.

Reforestation projects are helpful

If there is deforestation, this destroys the habitat of the howler monkey (and destroys the homeland of the jaguars, margay, ocelot, howler monkeys, and lots of birds and other rain forest animals). It really helps to **reforest.** Thus, projects to help local native plants regenerate in an area earlier destroyed to make a cattle ranch can really benefit the environment and provide a place for local flora and fauna to recuperate. Green Balam Forests S.A. is creating a corridor by protecting property that still has forests and reforesting land that was destroyed to make cattle pastures by the earlier owners.

Ironically one of the most important trees for the meals of the howler monkey is the previously mentioned fast-growing *Cecropia* tree. These trees are known locally as guarumo. Actually these trees provide food for dozens, scores of animals: birds and mammals in addition to just howler monkeys. Fortunately these trees are like giant weeds: they quickly grow in abandoned farm areas. So these are perfect to get seeded early, as howler monkeys LOVE guarumo trees.

Photo credits on page #11

It would be helpful to make an illustrated book for the local Mayan children on the life cycle of a guarumo trees and especially to show how many birds and how many mammals literally depend on this tree. Would help to show which birds and which mammals like the flowers, like the fruits, or like the fresh young leaves. FLAAR Mesoamerica has a team of illustrators and animators (school children like to watch animations which feature local birds and friendly animals).

So a multi-lingual illustrated children's book and a multi-lingual animated video could help everyone in Petén, Izabal, and Alta Verapaz learn about the guarumo tree as a crucial aspect of the diet of lots of birds and animals.

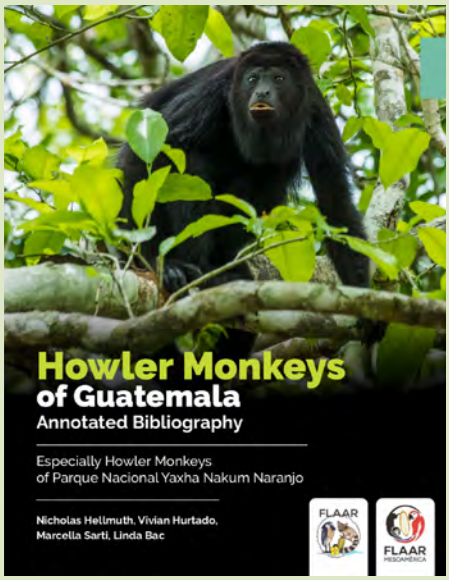
So, let's learn about all the other essential trees as well

After I learned how important the guarumo was I realized that I needed to learn what other trees are part of the needs of the howler monkey. So the first step was to make a bibliography of all articles, reports, thesis, dissertations, and books on the howler monkeys of Guatemala and surrounding areas. I also prepared a list of web sites, keeping in mind that most web sites are copy-and-paste from Wikipedia, so if there is an error in Wikipedia, that mistake is copied into dozens of web sites. So I prefer to focus on web sites of universities, botanical gardens, and respected institutions. It takes about a week to make a bibliography because every bibliography is in a different format, so the format of each entry has to be changed. Plus I prefer to read each article (or at least as many as time allows) to make sure the author(s) are botanists or zoologists or ecologists and make sure the information is reliable.

After I have the bibliography one of the university students who works with us, proofreads the bibliography and finds additional titles that I may have missed.

Then, for howler monkeys, I am interested in making a separate list of all the articles, theses, and dissertations that show what species of plants are eaten by howler monkeys. When you are reforesting an area it helps to know what trees to plant to provide a future home for howler monkeys.

So the present report is a step forward: what other trees, in addition to *Cecropia* (Guarumo) are helpful to protect (and to plant) to provide areas for howler monkeys? Spider monkeys will also be happy in these reforested areas but spider monkey food sources are a separate project since local spider monkeys tend to eat different plant foods than howler monkeys.

Mini-title, complete biblio	Mini-title, biblio of *Alouatta palliata*	The present report, what foods do howlers eat
		

The total bibliography on both species of howler monkeys is now available. We are also making a list of articles and reports on the rare second species of howler, *Alouatta palliata*. This mantled howler monkey is stated to be findable in Municipio de Livingston (but not in any departamento of Guatemala other than Izabal: so not any more in Petén or Alta Verapaz).

PHOTO CREDITS FROM PAGE 6

Photo by: Erick Flores, FLAAR Mesoamerica, Aug. 17, 2018, 7:46 am. Yaxhá-Nakum-Naranjo, Petén, Guatemala.

Camera: Canon 1D X Mark II. Lens: Canon EF 300mm IS II USM. Settings: 1/400 sec; f/3.5; ISO 2,500.

PHOTO CREDITS FROM PAGE 7

Photo by: Erick Flores, FLAAR Mesoamerica, Aug. 17, 2018, 7:46 pm. Yaxhá-Nakum-Naranjo, Petén, Guatemala.

Camera: Canon 1D X Mark II. Lens: Canon EF 300mm IS II USM. Settings: 1/400 sec; f/3.5; ISO 2,500.

PHOTO CREDITS FROM PAGE 8

Photo by: Erick Flores, FLAAR Mesoamerica, Aug. 18, 2018, 12:42 pm. Yaxhá-Nakum-Naranjo, Petén, Guatemala.

Camera: Canon 1D X Mark II. Lens: Canon EF 300mm IS II USM. Settings: 1/1,000 sec; f/5.6; ISO 640.

PHOTO CREDITS FROM PAGE 9

Photo by: Erick Flores, FLAAR Mesoamerica, Aug. 18, 2018, 12:41 pm. Yaxhá-Nakum-Naranjo, Petén, Guatemala.

Camera: Canon 1D X Mark II. Lens: Canon EF 300mm IS II USM. Settings: 1/1,600 sec; f/5.6; ISO 640.

I spent day after day after day looking for reports, thesis, and dissertations that had lists of what plants the howler monkeys ate. which I tabulated and is, shown below. What I learned through all this library research is that howler monkeys eat whatever leaves are in the area where they live. If they are on hilltops they eat leaves of hilltop trees. If they are in a flat area along the shore of a river or lake, a few of the hilltop trees will also be there as well (guarumo, palo de jiote, etc.) but there will also be different trees.

Howlers can't eat the leaves, flowers, or fruits of every tree. Some trees produce toxins in their leaves or stems, precisely to help make sure that no creature can eat them. So you really do need to have a good list. Indeed several lists (hilltop, lowland, etc.). Below is our tabulation in its first edition.

As soon as I can find Coelho et al. 1976 and Schlichte, 1978 I can make a list of what plants howler monkeys eat at Parque Nacional Tikal. So far, I have not located electronic versions (and all university libraries in Guatemala are closed since mid-March of last year). Our experienced bibliography assistant also searched and did not find Coelho et al. 1976 and Schlichte, 1978. By luck I came across a downloadable version of Schlichte so I add the plants mentioned by him.

Since the plant names in reports of the 1970's-1990's are today in 2021 considered synonyms, in the future it will be helpful to document which of the plant names below is an old synonym or is still an accepted name today.

I put in green background color the favorite trees in most locations:

- *Brosimum alicastrum*
- *Bursera simaruba*
- *Ficus* spp.

It is notable that Schliche did not include *Cecropia* for Tikal. This is a favorite food tree for howler monkeys. Perhaps there are so many ramón trees at Tikal that the howlers there don't need guarumo.

Photo credits on page #47

Photo credits on page #47

Photo credits on page #47

Schlichte´s Table 3 lists tree species "visited." He does not list which were eaten and absolutely not which parts of each tree. That is why I only list the six trees for Tikal that were clearly eaten (consistently and constantly).

Local names (primarily Belize)	**Horwich and Lyon 1993**	**Shepston 2007:42**	***A. pigra* in Monkey River, Belize**	***A. pigra* in RCNR, Belize**	***A. pigra* in Tikal park** Schlichte 1978
Acacia				*Acacia dolichostachya*	
Cabbage bark, Ball Seed tree (different names in each list)			*Andira enermis*	*Andira enermis*	
Chico zapote					*Archas zapota*
Jobillo				*Astroneum graveolens*	
Malerio blanco					*Aspidosperma megalocapon*
Ramón, Wild Breadnut	*Brosimum alicastrum*	*Brosimum alicastrum*		*Brosimum alicastrum*	*Brosimum alicastrum*
Gumbo limbo, chacaj	*Bursera simaruba*	*Bursera simaruba*		*Bursera simaruba*	*Bursera simaruba*
Warrie wood				*Caesalpinia gaumeri*	
Bucut, carao, cañafistula	*Cassia grandis*				
Hule, rubber tree		*Castilla elastica*			
Guarumo, Trumpet tree	*Cassia grandis*				
Hule, rubber tree	*Cecropia peltata*		*Cecropia obtusifolia*		
		Ceiba pentandra			

Local names (primarily Belize)	**Horwich and Lyon 1993**	**Shepston 2007:42**	***A. pigra* in Monkey River, Belize**	***A. pigra* in RCNR, Belize**	***A. pigra* in Tikal park** Schlichte 1978
Chaparro			*Curatella americana*		
				Dialium guianense	
Strangler Fig			*Ficus crassiuscula*		
Wild fig	*Ficus insipida* *Ficus glabrata*		*Ficus* spp.	*Ficus* spp.	*Ficus* spp.
Black Bay Cedar			*Guazuma ulmfolia*		
Bri bri	*Inga edulis*		*Inga edulis*	*Inga edulis*	
		Lonchocarpus spp.			
Yellow Bay Cedar			*Luehea seemannii*		
Sapodilla	*Manilkara zapota*				
Sering			*Miconia argentea*		
			Myriciara floribunda		
Provision, pumpo, zapotón,			*Pachira aquatica*		
Dogwood	*Piscidia piscipula*				
Red sillionb				*Pouteria amygdalina*	
Mammee Cirellab				*Pouteria dourlendii*	

Local names (primarily Belize)	**Horwich and Lyon 1993**	**Shepston 2007:42**	***A. pigra* in Monkey River, Belize**	***A. pigra* in RCNR, Belize**	***A. pigra* in Tikal park** Schlichte 1978
Copal				*Protium copal*	
Wild Cherry				*Pseudomeldia spuria*	
Swamp Kaway			*Pterocarpus officinalis*	*Pterocarpus officinalis*	
Royal Palm			*Roystonia regia*		
Rain tree				*Samanea saman*	
Cream wood				*Sideroxylon floribundum*	
Hogplum	*Spondias*		*Spondias mombin*		
Roseapple	*Syzygium jambos*				
Red Ramón			*Trophis racemosa*		
Catclaw		*Uncaria tomentosa*			
Fiddle wood			*Vitex gaumeri*	*Vitex gaumeri*	
Cola de garobo					*Ximenia americana*
Prickly Yellow			*Zanthoxylum kellermanii*		
			Freshwater Moho Not identified as to species.	*Plus several vines, mostly unidentified*	

Photo credits on page #47

Photo credits on page #47

Here below is the longer list for Tikal by Schlichte 1978; I assume they all have edible parts for the howlers but this is not in the caption; the caption says only "visited". But if you are reforesting a cattle pasture or other destroyed area, it helps to know which trees are favorites for the howlers. The original list (1978: Table 3) is by frequency.

As is no surprise, one or more of the Latinized botanical names was not spelled correctly:

- *barletii* should be *barlettii*;
- *megalocapon* should be *megalocarpon*
- *Allophylas* should be *Allophylus*

And several plant names "don't exist" (or are definitely not accepted names). So, I did my best to find accepted names. In the year he wrote that report none of the super computers nor incredible resources that today are available in seconds on the Internet (to check spelling).

Here are more than 25 species of trees that Howler monkeys likes to visit:

Local names	**Name used in 1978**	**Accepted name today from ThePlantList**
Ramón	*Brosimum alicastrum*	*Brosimum alicastrum*
Chico zapote	*Archas zapota*	*Manilkara zapota*
Tzol	*Tikalia prisca*	*Tikalia prisca*
Amaté	*Ficus* sp.	
Huevos de caballo	*Stemmadenia mombin*	*Tabernaemontana donnell-smithii* is the more likely name
Higo	*Ficus* sp.	
Mano de León	*Sterculia apetala*	*Sterculia apetala*
Malerio blanco	*Aspidosperma megalocapon*	*spidosperma megalocarpon*
Chacaj	*Bursera simaruba*	*Bursera simaruba*

Local names	Name used in 1978	Accepted name today from ThePlantList
Jobo	*Spondias mombin*	*Spondias mombin*
Cedro	*Cedrela odorata*	*Cedrela odorata*
Yaxnic	*Vitex gaumeri*	*Vitex gaumeri*
Salión	*Pouteria amygdalina*	*Pouteria amygdalina*
Chimón	*Ficus* sp.	
Manchiche	*Lonchocarpus castilloi*	*Lonchocarpus castilloi*
Cedrillo	*Trichilia birta*	Could be *Trichilia pallida*
Caoba	*Swietenia macrophylla*	*Swietenia macrophylla*
Chilechachalaca	*Allophylas cominia*	*Allophylus cominia*
Pimenta	*Pimenta dioica*	*Pimenta dioica*
Salte mucho	*Sickingia salvadorensis*	*Simira salvadorensis*
Chintoc	*Wimmeria bartletii*	*Wimmeria bartlettii*
Sackiché	*?*	
Cola de garabo	*Ximenia americana*	*Ximenia americana*
Copál	*Protium copal*	*Protium copal*
Quebracho	*Krugiodendron ferreum*	*Krugiodendron ferreum*
Botán	*Sabal* sp.	

Local names	Name used in 1978	Accepted name today from ThePlantList
Capulin silvestre	*Xylopia frutescens*	*Xylopia frutescens*
Sesmóo	?	Possibly *Acacia dolichostachya*
Guaya	*Talisia olivaefermis*	*Talisia acutifolia*
Ceiba	*Ceiba pentandra*	*Ceiba pentandra*

You can find even longer howler monkey edible-tree lists in other parts of the Americas in the helpful symposium publication: *The Ecology of Arboreal Folivores*, G. Gene Montgomery, editor, Smithsonian Institution Press, 1978.

We will update these notes when we can get our hands on a Xerox copy or a scanned copy of whichever Coelho et al. lists of trees they noted as eaten by howlers. Coelho et al. 1977 has no species list. The trees available at Tikal are pretty much comparable to trees available on the hilltops around Yaxha.

Some leaves, buds, flowers, etc. provide more chemicals that help the Howler. So yes, they are picky and choosey, but also adaptable. When I was in China in past years, I ate food that I can't find in supermarkets in USA. When I am in Guatemala I eat bledo leaves (leaves of amaranth plants); not available in markets in USA. Amaranth grain is available in USA but not the leaves. Plus, there are zapote and *Passiflora* fruits in markets of Guatemala that are rarely findable in St. Louis (where my official residence is). So, like the Howler Monkey, I adapt to what is available.

So far, the best lists of what an *Alouatta pigra* monkey needs to survive are by Trolliet (2010) because he even indicates which part of the plants are eaten: flowers, leaves, stems, etc.

- New leaves (NL),
- Mature leaves (ML),
- Unknown leaves (UL)
- Leaf buds (LB)
- Fruits (Fr)
- Flowers (Fl)
- Stem (St)
- Seeds (Se)

Cedrela odorata

Cedro is one of the trees visited by howler monkeys listed for Tikal by Schlichte, 1978

Aspidosperma megalocapon

Malerio blanco tree is also visited by Howler monkeys (Schlichte, 1978).

Was interesting to read (in Días et al. 2015) that *Alouatta palliata* do not eat fruit (p. 40). I would suggest modifying this to read "*A. palliata* did not eat fruit in the areas whose reports we used (up to year 2012)". I suggest this modification since none of these reports were for what the *A. palliata* has available to eat along the Río Dulce, Municipio de Livingston, Izabal, Guatemala. But every observation by Días and their team are useful:

> Besides fruits, leaves, and flowers, howlers consume lesser amounts of a variety of OFI. These include: other plant items, such as bark, gum, decayed and live wood, pine cones, pods, pseudobulbs (from epiphytes), roots, stems (including twigs) and herbs; chicken eggs; honey; insects (eggs, larvae, and adults); lichens; mushrooms; nectar; soil; and termitaria. Concerning the ingestion of insects, howlers inadvertently eat Hymenoptera (e.g., Blastophaga), Diptera, and Coleoptera (e.g., Curculionidae) (Hladik and Hladik 1969; Milton 1980; Gaulin and Gaulin 1982; Alves and Guix 1992; Serio-Silva 1995; Bravo and Zunino 1998) that infest fruits, and these insects may be an important source of vitamins, minerals, and amino acids that can only be obtained from animal source foods (Urquiza-Haas et al. 2008).
>
> (Días and Rangel 2015: 40-41)

These observations can help field teams to know what to look for of howler monkeys in PNYNN and in the areas outside the park (obviously it is important to help howler monkeys to survive outside park areas).

They do not include Trolliet's 2010 thesis, which is all the more curious since they state in the opening words of their academic discussion that they focused on theses and dissertations that were available up to 2012 (sad that the monograph did not appear until 2015).

Howler Monkeys in northern Alta Verapaz are "missing" from reports

Other information on howlers of Laguna Lachuá area, there are not many articles, reports, theses, or dissertations on howler monkeys of Alta Verapaz. A good example is when you search for Verapaz in Días and Rangel 2015, sadly, no research projects on howler monkey diet were found up to 2012. Yet several parts of the Alta Verapaz area of Guatemala is FILLED with happy howler monkeys.

Howler Monkeys in Izabal definitely need more study

Howler monkeys in Izabal are embarrassingly missing in most summary reports. When you search for Izabal in the Días and Rangel 2015 document, there are zero returns. On their map of where the studies took place and that they cite, Izabal seems to be under a square, but there is no detail on the map and no list of areas, so the fact that Izabal does not appear in the bibliography suggests there are no studies of the diet of the howler monkeys in Izabal. So, that means neither the departamento of Izabal nor the lake of Izabal are included (because there are no PhD dissertations of theses on the howler monkey´s diet up to year 2012)? This is doubly-sad because there are double the number of Howler monkey species in Izabal; Petén and Alta Verapaz have *A. pigra*; Izabal has *Alouatta pigra* and also the multi-colored *A. palliata*. So it is definitely important to do field work in Izabal. If you are looking for monkeys definitely skip the coast facing Amatique Bay and El Estor and Canyon de Río Dulce areas. If there were howlers spotted here in past years they are totally gone because in field trips each month, we did not have howlers 90% of the days.

Howler Monkey Studies for Parque Nacional Yaxha, Nakum and Naranjo?

When you search for Petén in Días and Rangel 2015 there are zero returns. Zero returns for Yaxha or Nakum or Naranjo. But there is a return for Tikal, the same 1978 document that I cite (but which as of 25 May 2020 I still do not have a PDF or MS Word electronic version to be able to study) it; I did not find it until a year later (since I was also doing research on scores of other flora and fauna).

When you search for Guatemala in this summary of howler monkey research up to 2012, there are only two returns; one for Tikal and one for Guatemala. This is a rather clear documentation of how essential it is to plan, prepare, and initiate serious fresh new field work research on howler monkeys of Petén.

Most howler monkey research (and other mammals, birds, etc.) is done in Costa Rica or Barro Colorado Island in Panamá. Yet there are plenty of nature reserves in Guatemala and lots of howler monkeys, spider monkeys, woolly ant eaters, jaguars, and everything else in Guatemala. Howler monkeys are both all over the trees of Petén but also in northern Alta Verapaz. We have been totally surprised by the 99% lack of howler monkeys in most areas of the Municipio de Livingston that are along rivers, creeks, or lagoons. Hopefully there are monkeys up in the hills of Izabal (though even when we hike into the hills, 98% of the days doing field work in hills, there is not any kind of monkey whatsoever). But in many areas of Petén monkeys are literally everywhere. You see dozens every day.

So if you are a zoologist, biologist or student, the entire Reserva de la Biosfera Maya is awaiting you. Within this area are dozens of parks and nature reserves: Tikal, Parque Nacional Yaxha, Nakum y Naranjo, and lots of nearby areas of protected forests.

Next Step to help Howler Monkeys

Paperwork and preparing videos to seek grants is extremely time consuming; we have the unfortunate habit of spending all our time on field trips gathering fresh data or back in our office doing library research and writing reports. It would be best to team up with an entity that is experienced and capable in fund-raising. Our benefit is that we can accomplish the research. Plus, we are probably one of the few botanical and zoological field research teams that also has in-house capability to prepare children's books and even more important, to prepare animated videos to help children learn to help save the fragile ecosystems around their homes. Plus, not many other universities or research entities focus on high resolution photography of flora and fauna. Our initiative to get out into remote areas and accomplish results is why government agencies keep requesting our help. If you know a source of funding for preservation of fragile ecosystems, or a source of funding that could make it possible for us to prepare and publish our findings in a coffee-table photography style book, we would appreciate your assistance. It would be helpful to have a publisher for our children's books from our MayanToons teams.

Nonetheless, we will be out in the field taking notes on remarkable bio-diverse ecosystems and endangered species in Petén several days each month for five years and still several days each month for seven months in the Municipio de Livingston.

Photo credits on page #47

Photo credits on page #47

Photo credits on page #47

Photo credits on page #47

List of articles, theses, and dissertations which discuss which trees and plants Howler Monkeys need to survive

Most helpful thesis, dissertation or monographs on howler monkey diet

TROLLIET, Franck

2010 Ecology of the Belizean black howler monkey (*Alouatta pigra*): a comparison between two populations living in a riparian forest and on coastal limestone hills. Thesis, Université de Liege.

Most helpful monographs on howler monkey diet

1978 The Ecology of Arboreal Folivores, G. Gene Montgomery, editor, Smithsonial Institution Press.

Most helpful articles on what howlers eat:

Diets of Howler Monkeys by Pedro Américo D. DIAS and Ariadna RANGEL-Negrín

This report blows away the previous century of field work. This report documents what would be helpful in Petén, in Alta Verapaz, and in Izabal areas: full-time, multi-month, full-team, realistically funded project with open cooperation with local people.

Most helpful web sites on this mammal:

No major web site on howlers have fresh information; most lack any mention or knowledge of Izabal and Alta Verapaz; and their maps showing where howler monkeys are found are so inaccurate I can't believe such a map is repeatedly used (for sites that we have found so far; hopefully we can find better more accurate web sites in the future, with fresh factual information, based on field work).

Annotated List of Suggested Reading to learn about what Howler Monkeys Eat in Guatemala and nearby

AMATO, Katherine Ryan

2013 Black howler monkey (*Alouatta pigra*) nutrition: Integrating the study of behavior, feeding ecology and the gut microbial community. Submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Ecology, Evolution, and Conservation Biology in the Graduate College of the University of Illinois at Urbana-Champaign. 223 pages.

Download: www.ideals.illinois.edu/bitstream/handle/2142/45368/Katherine_Amato.pdf?sequence=1&isAllowed=y

AMATO, Katherine R., YEOMAN, Carl J., KENT, Angela, RIGHINI, Nicoletta, CARBONERO, Franck, ESTRADA, Alejandro, REX-Gaskins, H., STUMPF, Rebecca, M., YILDIRIM, Suleyman, TORRALBA, Manolito, GILLIS, Marcus, WILSON, Brenda A, NELSON, Karen E., WHITE, Bryan A. and **Steven R. LEIGHT**

2013 Habitat degradation impacts black howler monkey (*Alouatta pigra*) gastrointestinal microbiomes. *The ISME Journal* 7, 1344–1353

Download: www.nature.com/articles/ismej201316.pdf

ARISTIZABAL-Borja, John, POZO-Montury, Gilberto, PÉREZ-Torres, Jairo and J**uan Carlos SERIO-Silva**

2011 Anotaciones de la ecología alimentaria de monos aulladores negros en un fragmento con condiciones de hacinamiento (Balancán, Tabasco, México).

Download: https://revistas.javeriana.edu.co/index.php/scientarium/article/view/1645

BEHIE, Alison M. and **Mary S. M. PAVELKA**

2005 The Short-Term Effects of a Hurricane on the Diet and Activity of Black Howlers (*Alouatta pigra*) in Monkey River, Belize. *Folia Primatol.*, 76: 1-9.

BEHIE, Alison M., STEFFENS, Travis S., WYMAN, Tracy M. and **Mary S. M. PAVELKA**

2015 Hurricanes and coastlines: The role of natural disasters in the speciation of howler monkeys. Chapter 4, pp. 75-91, in *Taxonomic Tapestries: The Threads of Evolutionary, Behavioural and Conservation Research* (Alison M. Behie and Marc F. Oxenham, editors). ANU Press, The Australian National University, Canberra, Australia.

Download: http://press-files.anu.edu.au/downloads/press/p318011/pdf/4.-Hurricanes-and-coastlines-The-role-of-natural-disasters-in-the-speciation-of-howler-monkeys.pdf

BEHIE, Alison M. and **Mary S. M. PAVELKA**

2015 Fruit as a Key Factor in Howler Monkey Population Density: Conservation Implications. Chapter 13, pp. 357-382, in: M. M. Kowalewski et al. (eds.), *Howler Monkeys, Developments in Primatology: Progress and Prospects. Springer.*

BRIDGEMAN, LeAndra Luecke

2012 The Feeding Ecology of Yucatán Black Howler Monkeys (*Alouatta pigra*) in Mangrove Forest, Tabasco, México. PhD dissertation, Washington University. 203 pages.

Download: https://openscholarship.wustl.edu/cgi/viewcontent.cgi?article=1998&context=etd

BRIDGETT, G. R.

2006 The effects of fruit availability and abundance on the diet and ranging behavior of the black howler monkeys (*Alouatta pigra*) of Monkey River, Belize. MA thesis, University of Calgary, Calgary, Alberta.

COELHO Jr., Anthony M.

1974 Energy budget of Guatemalan howler and spider monkeys: A Sociobioenergetic analysis. Ph.D. dissertation, University of Texas.

COELHO Jr., Anthony M., COELHO, L., BRAMBLETT Claud A., BRAMBLETT, Sharon S. and **Larry B. QUICK**

1976a Ecology, population characteristics, and sympatric associations in primates: A socioenergetic analysis of howler and spider monkeys in Tikal, Guatemala. *Yearb. Phys. Anthropol.* 20:96–135.

COELHO Jr, Anthony M., BRAMBLETT, Claud A, QUICK, Larry B. and **Sharon S. BRAMBLETT**

1976b Resource Availability and Population Density in Primates: A Socio–Bioenergetic Analysis of the Energy Budgets of Guatemalan Howler and Spider Monkeys. *Primates* 17(1): 63-80.

COELHO Jr., Anthony M., BRAMBLETT, Claud A. and **Larry B. QUICK**

1977 Social Organization and Food Resource Availability in Primates: A Socio–Bioenergetic Analysis of Diet and Disease Hypothesis. *American Journal of Physical Anthropology* 46(2):253-264.

CRISTOBAL-Azkarte, Jurgi and Victor ARROYO-Rodríguez

2007 Diet and activity pattern of howler monkeys (*Alouatta palliata*) in Los Tuxtlas, México: effects of habitat fragmentation and implications for conservation. American Journal of Primatology, Volume 69, Issue 9

Free download available courtesy of ResearchGate: www.researchgate.net/publication/6476899_Diet_and_activity_pattern_of_howler_monkeys_Alouatta_palliata_in_Los_Tuxtlas_Mexico

DÍAS, Pedro Américo D. and **Ariadna Rangel-Negrín**

2015 Diets of Howler Monkeys. Chapter 2, pp. 21-55, in: M. M. Kowalewski et al. (eds.), Howler Monkeys, Developments in Primatology: Progress and Prospects. Springer.

These authors compiled data from field work of zoologists and botanists and ecologists to provide a helpful total overview. Their work covers México through Central America and South America. So even though they themselves did not hike through the forests day after day month after month their research is still very helpful.

Download: www.uv.mx/personal/pdias/files/2011/03/DiasRangel2015.pdf

DUNN, Jacob C., CRISTÓBAL-Azkarte and **Joaquim J. VEA**

2009 Differences in diet and activity pattern between two groups of *Alouatta palliata* associated with the availability of big trees and fruit of top food taxa. Am. J. Primatol. 71:654–662

Download available courtesy of ResearchGate: www.researchgate.net/publication/24420129_Differences_in_diet_and_activity_pattern_between_two_groups_of_Alouatta_palliate_Associated_with_the_availability_of_big_trees_and_fruit_of_top_food_taxa

ESTRADA, Alejandro and **Rosamond COATES-Estrada**

1984 Fruit eating and seed dispersal by howling monkeys (*Alouatta palliata*) in the tropical rain forest of Los Tuxtlas, Mexico. American Journal of Primatology, Volume 6, Issue 2.

Free download available courtesy of ResearchGate: www.researchgate.net/publication/227661232_Fruit_eating_and_seed_dispersal_by_howling_monkeys_Alouatta_palliata_in_the_tropical_rain_forest_of_Los_Tuxtlas_Mexico

ESTRADA, Alejandro

1984 Resource use by howler monkeys (*Alouatta palliata*) in the rain forest of Los Tuxtlas, Veracruz, México. International Journal of Primatology volume 5, pages105–131.

Download available courtesy of ResearchGate: www.researchgate.net/publication/225592931_Resource_use_by_howler_monkeys_Alouatta_palliata_in_the_rain_forest_of_Los_Tuxtlas_Veracruz_Mexico

ESTRADA, Alejandro, JUAN-Solano, Saúl, ORTÍZ-Martínez, Teresita and **Rosamond COATES-Estrada**

1999 Feeding and general activity patterns of a howler monkey (*Alouatta palliata*) troop living in a forest fragment at Los Tuxtlas, México. American Journal of Primatology, Volume 48, Issue 3.

Sold online: https://onlinelibrary.wiley.com/doi/epdf/10.1002/%28SICI%291098-2345%281999%2948%3A3%3C167%3A%3AAID-AJP1%3E3.0.CO%3B2-6

FREIWALD, C. R.

2010 Dietary Diversity in the Upper Belize River Valley: a Zoo-archaeological and Isotopic Perspective. pp. 399-420, In: Pre-Columbian Foodways: interdiscipilanary approaches to food, culture, and markets in ancient Mesoamerica. (J. E. Staller and M. D. Carrasco, editors). Springer Science.

You can read a bit on Google Books (but not free as download).

LOUDON, J.

2000 Diet, activity and ranging behavior of *Alouatta pigra* in Monkey River, Belize. MA thesis, University of Calgary, Calgary, Alberta. 138 pages.

Download: https://prism.ucalgary.ca/bitstream/handle/1880/40722/49574Loudon.pdf?sequence=1&isAllowed=y

MARSH, L. K.

1999 Ecological effect of the black howler monkey (*Alouatta pigra*) on fragmented forests in the Community Baboon Sanctuary, Belize. PhD dissertation, Washington University, St. Louis, Missouri.

MILTON, Katherine

1978 Behavioral Adaptation to Leaf-eating by the Mantled Howler Monkey (*Alouatta palliata*). pp 535-550, In: The Ecology of arboreal Folivores (G. Gene Montgomery, editor). Smithsonian Institution Press.

MILTON, Katherine

1993 Dieta y evolución de los primates. Investigación y ciencia.

Download: www.bioquimica.dogsleep.net/Teoria/Seminario/NIYC1093_056.pdf

NAGY, Kenneth A. and **Katherine MILTON**

1979 Aspects of dietary quality, nutrient assimilation and water balance in wild howler monkeys (*Alouatta palliata*). Oecologia volume 39, pages 249–258.

NAGY, Kenneth A. and **Katherine MILTON**

1979 Energy Metabolism and Food Consumption by Wild Howler Monkeys (*Alouatta Palliata*). Ecology Volume 60, Issue 3

Sold online: https://esajournals.onlinelibrary.wiley.com/doi/epdf/10.2307/1936066

PAVELKA, Mary S. M. and **K. KNOPFF**

2004 Diet and activity in black howler monkeys (*Alouatta pigra*) in southern Belize: does degree of f rugivory influence activity level? Primates 45:105–111.

Full-text available courtesy of ResearchGate: www.researchgate.net/publication/8910389_Diet_and_activity_in_black_howler_monkeys_Alouatta_pigra_in_southern_Belize

POZO-Montuy, Gilberto and **Juan Carlos SERIO-Silva**

2006 Comportamiento alimentario de monos aulladores negros (*Alouatta pigra* Laurence, Cebidae) en hábitat fragmentado en Balacán, Tabasco, México. Acta Zoológica Mexicana (n.s.) 22(3): 53-66

RIGHINI, Nicoletta

2014 Primate nutritional ecology: The Role of food selection, energy intake and nutrient balancing in Mexican black howler monkey (*Alouatta pigra*) foraging strategies. Submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Anthropology in the Graduate College of the University of Illinois at Urbana-Champaign. 193 pages.

Download: www.ideals.illinois.edu/bitstream/handle/2142/49549/Nicoletta_Righini.pdf?sequence=1&isAllowed=y

RIVERA, Mariana, CALMÉ, Sophie, RAMOS, Gabriel and **Jesús ESTRADA**

2004 Dieta del mono aullador negro (*Alouatta pigra*) en sitios con diferente estado de conservación en la región de Calakmul, Campeche, México / Andrómeda Mariana Rivera Castañeda. Chetumal, Quintana Roo, México : El Colegio de la Frontera Sur. 39 pages.

Available online at no cost: http://bibliotecasibe.ecosur.mx/sibe/book/000043142

SCHLICHTE, Hans-Jörg

1978 A preliminary report on the habitat utilization of a group of Howler Monkeys (*Alouatta villosa pigra*) in the National Park of Tikal, Guatemala. pp 551–559, In: The Ecology of arboreal Folivores (G. Gene Montgomery, editor). Smithsonian Institution Press.

I finally found a scanned copy in May 2021: https://ia903109.us.archive.org/10/items/ecologyofarborea00mont/ecologyofarborea00mont.pdf

SHEPSTON, Desserae Kelly

2007 Evidence to Support the Successful Reintroduction of *Alouatta pigra* to the Naha Region of Chiapas, Mexico. Texas State University-San Marcos. 92 pages.

It is nice to see a Master's thesis longer than 48 pages.

Download, Courtesy of Texas State University-San Marcos: https://digital.library.txstate.edu/handle/10877/4076

SILVER, S. C., OSTRO, L. E. T., YEAGER, C. P. and **R. HOWRICH**

1998 Feeding ecology of the black howler monkey (*Alouatta pigra*) in Northern Belize. American Journal of Primatology 45:263–279.

Download: www.cs.mcgill.ca/~dtremb8/fulltext.pdf

TEAFORD, M. F., LUCAS, P. W., UNGAR, P. S. and **K. E. GLANDER**

2005 Mechanical Defenses in Leaves Eaten by Costa Rican Howling Monkeys (*Alouatta palliata*). American Journal of Physical Anthropology, Volume 129, Issue 1.

Download: https://dukespace.lib.duke.edu/dspace/bitstream/handle/10161/6366/06%20Teaford%20et%20al-tough%20.pdf?sequence=1&isAllowed=y

TOMBLIN, David C. and **Jack A. CRANFORD**

1994 Ecological niche differences between *Alouatta palliata* and *Cebus capucinus* comparing feeding modes, branch use, and diet. Primates Volume 35, pages 265–274

TROLLIET, Franck

2010 Ecology of the Belizean black howler monkey (*Alouatta pigra*) a comparison between two populations living in a riparian forest and on coastal limestone hills. Thesis, Université de Liege.

Download from: https://orbi.uliege.be/bitstream/2268/154280/1/Master%20thesis%20-%20Ulg%20-%20Comparison%20Black%20Howler%20Monkey%20-%20%20Franck%20Trolliet.pdf

Suggested web sites with information about feeding resources for *A. pigra* and *A. palliata*

General Information
This report may be cited with this information: Khalid, W. (2021, 20 abril). What Do Howler Monkeys Eat | Howler Monkey Diet. Animals Time. https://animalstime.com/what-howler-monkeys-eat/. Flaar Mesoamérica and Flaar (USA).

General information
This report may be cited with this information: Mono Aullador, Características - BioEnciclopedia. (2020, 27 enero). BioEnciclopedia | Biodiversidad, Animales, Medio Ambiente, Vida. https://www.bioenciclopedia.com/mono-aullador/. Flaar Mesoamérica and Flaar (USA).

www.conanp.gob.mx/conanp/dominios/especies/pdf_especies/mono_aullador_negro.pdf
Alouatta pigra information.

***Alouatta palliata* information.**
This report may be cited with this information: *Alouatta palliata* - Prima-T. (s. f.). primates.inecol.edu.mx. Recuperado 25 de junio de 2021, de http://primates.inecol.edu.mx/leer_mas_c/texto1. Flaar Mesoamérica and Flaar (USA).

***Alouatta palliata* information.**
This report may be cited with this information: *Alouatta pigra* - Prima-T. (s. f.). primates.inecol.edu.mx. Recuperado 25 de junio de 2021, de http://primates.inecol.edu.mx/leer_mas_c/texto2. Flaar Mesoamérica and Flaar (USA)

FLAAR MESOAMÉRICA FLAAR

APPRECIATION
for help in experiencing Howler Monkeys

We thank Gabriella Moretti, Sebastian de la Hoz, and Juan Carlo de la Hoz for providing a room in their family owned and operated hotel Ecolodge El Sombrero. Plus, the friendly kitchen staff and the helpful gardener (who knows where key plants can be found out in the forests).

It is essential to have a place to sleep comfortably and thereby recuperate every night from the long days of hiking, climbing hills, setting up complex photographic equipment throughout the adjacent PNYNN park area. 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 y Naranjo.

Also very helpful was the electricity in the Ecolodge El Sombrero since solar power can't handle charging all the computers, all the flash lighting equipment, all the cameras, all the other equipment. A place with enough electricity to charge the entire mass of essential field work equipment is essential and thus very much appreciated. Spider monkeys and howler monkeys swing through the trees around the hotel grounds and every night and early morning the troops of howler monkeys roar into the horizon to keep the other troops at bay.

Contact Information:

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

The comfortable and hospitable Estación Biológica Las Guacamayas, in past years of Nini Berger (and Francois Berger), has been a great place to study both spider monkeys and howler monkeys in the area along the Río San Pedro, in western Petén.

The manager in those years and still today is Jeovany Tut and local guides including Cornelio Chablé and kitchen staff are all very hospitable and helpful. You can see monkeys from the porch of your bungalow.

We appreciate the hospitality of Julian Mariona and his family in Sayaxché and at their family hotel Hotel Ecológico Posada Caribe along the Río Petexbatún. Julian and his family protect the trees to provide a natural ecosystem for the local howler monkeys. The Mariona family have coordinated field trips for FLAAR since the 1970's. Monkeys howl literally overhead around the hotel area every day because the family leave enough trees for them to feel welcome around the bungalows.

For their cooperation, hospitality, and assistance at Parque Nacional Yaxha 2018-2019, we thank

- Ing. Jorge Mario Vazquez, Co-Administrator of the PNYNN (CONAP, Santa Elena, Petén)
- Arq. Jose Leonel Ziesse, Co-Administrator of the PNYNN (IDAEH, Santa Elena, Petén)
- Biolg. Lorena Lobos (CONAP), park biologist at PNYNN

At the Naranjo sector of PNYNN, we thank

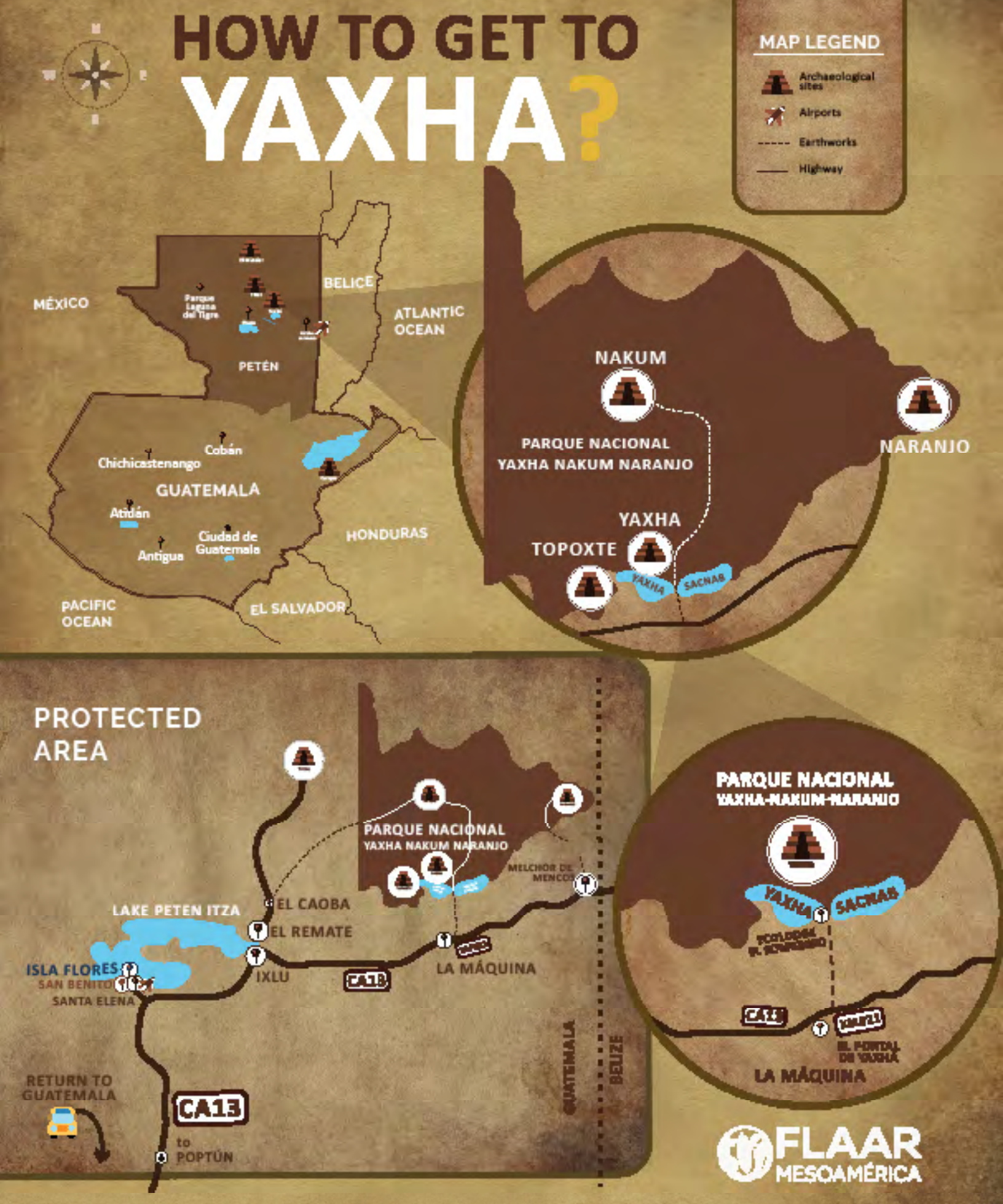
- Arqueóloga Vilma Fialko
- Arquitecto Raúl Noriega
- Naranjo project team member who knows local plants, Horacio Palacios,

and 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. On each month's field trip, the cooperation and assistance of additional different park rangers is appreciated.

When sleeping in the PNYNN camp area there are howler monkeys and spider monkeys all around the buildings.

HOW TO GET TO YAXHA?



FLAAR MESOAMÉRICA

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.

We look forward to studying which trees Howler Monkeys need in Municipio de Livingston, Izabal, Guatemala

If the second species of howler (mantled howler monkey) can be found along the Río Dulce, and photographed, this would be almost unique, since most photographs are of the common black howler monkey, *Alouatta pigra*, from the interior of the Municipio. And 90% of the photos of *Alouatta palliata* in books and articles on primates of Mesoamérica are from Veracruz or Tabasco, México or from Honduras through Costa Rica, Panamá and into northern Perú. Unfortunately, so far, in about 10 weeks of field trips to the Municipio of Livingston I have heard a howler monkey only three times and never seen one, neither along Río Dulce nor in any nature reserve. Perhaps they prefer the high hills, but even in Cerro San Gil they are rare (never saw or heard on during two field trips to the west end of Cerro San Gil). Let's rescue knowledge of both species of howler monkeys from the Municipio de Livingston.

ASSISTANCE FOR LOCAL ACCESS, MUNICIPIO DE LIVINGSTON

Daniel Esaú Pinto Peña, Alcalde of Livingston (Izabal, Guatemala).

PERMISSIONS for you to post this .pdf

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
- www.maya-ethnozoology.org
- www.maya-archaeology.org
- www.digital-photography.org
- 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 Guatemala and nearby countries 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, Petén, Alta Verapaz, 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.

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.

Petén:
My Heart and Soul are in Petén

Chiapas, Tabasco, Campeche, Quintana Roo, Belize, Honduras, and national parks in El Salvador (such as El Imposible) are remarkable areas to study flora, fauna, and ecosystems. The wetlands of all these areas are especially awesome. If I had ten more life-times to do field work, I would definitely love to live and work in Chiapas, Tabasco, Campeche, Quintana Roo, Belize and adjacent areas. I have already spent much of my life in all these areas 1960's-1990's, and in recent decades primarily in Petén and Alta Verapaz. In 2020 began to add more of the Municipio de Livingston, Izabal to my focus.

Tabasco and Chiapas were where I visited at ages 16 and 17, as a solitary back-packer. But then in 1963 and again in 1964 I began to visit and explore Petén. I can remember riding a mule to Uaxactun, and, at age 18, taking a canoe ride down the Arroyo Subín to reach Río la Pasión to reach Sayaxché. About six times I have taken the river trip from Alta Verapaz, through Petén, through Chiapas, through the rapids past Piedras Negras, ending up at Tenosique, Tabasco, México (about a week's trip with complete boat crew, kitchen crew, tents, etc.). Occasionally botanist Jim Conrad and zoologist Alfredo Cuarón would join us because we could get them into remote areas not reachable by an individual by themselves. So also NatGeo personnel and many university professors came along with us since we had experience with boat equipment and the entire route for over more than a decade.

Every decade I led tour groups through all these areas of Mesoamérica (and to Perú and Bolivia). I spent two summers doing archaeological work in Perú; one of these summers was to explore the mountain areas around Huarochiri. Seeing condors overhead while so deep into the mountains that the only place to spend the night was in a circular domed native rock structure; size and shape of an igloo, but of rocks. But my preference is to sleep under palm fronds while overnighting leading a study group to El Mirador (already in the 1980's). And I will admit my preference is to continue doing work in Petén (and Izabal and Alta Verapaz).

When I am in Sayaxché, waiting to cross the ferry, local people come up to say hello and say they were my boatman 30 years ago or my lanchero taking me to Arroyo Pucté to learn about water lilies (this is where water lilies bloom underwater). When stopping on

the main highway (Flores to Melchor) to study an interesting flowering plant along the side of the highway, the local Petenero came out of his house to see who was stopping. He then rushed up and gave me an "abrazo" and said he had worked for me 40 years ago. So, I feel totally at home in Petén.

What is crucial in field work is to coordinate, cooperate, and work together with the local people. This is why doing field work in Parque Nacional Yaxha, Nakum and Naranjo is a great place for studying flora and fauna, as was Tikal when I studied plants and animals there at the invitation of biologist Mirtha Cano. At PNYNN you have a biodiversity that is awesome: multiple lakes, lagoons, water-filled cenotes, rivers (Río Ixtinto), seasonally dry stream beds (Río Holmul), seasonally inundated wetlands (many with water even at the height of the dry season of a dry year). You have savannas, tintals, aguadas, pital ecosystems, cibal (cival, sibal) sawgrass habitats, native thorny bamboo jimbal ecosystems (along one or sometimes both sides of Río Holmul plus west of Naranjo ruins sector where the canal runs). There are fern bogs, fern savannas; the Savanna East of Nakum has a different habitat every 60 to 80 meters; the Savanna of 3 Fern Species has a different habitat every 20 to 50 meters. The Savanna East of Nakum has a complete ecological glossary of habitat types within a single kilometer of length and about 200 to 300 meter width.

For palms you get corozeras (corozal), guanal, escobal ecosystems (and often a mixture of guano and escoba palm "jungles", west of Nakum).

If you wanted to accomplish a PhD dissertation on vines and lianas you would need to dedicate an entire year to field work: since in every ecosystem there are different vines and lianas.

If I were to do a PhD dissertation or major project On mushrooms of Guatemala, obviously the Maya Highlands are a crucial area. We have found botanical wonders hiking through the misty-moisty hills and mountains of Guatemala during mushroom season. But frankly Petén is mushroom heaven as well; here you can even find the "faux mushrooms" a growth that looks identical to a mushroom but is not a mushroom. 3-dimensional lichen also intrigue me. These are common in many areas of PNYNN, especially the northern part of the Nakum sector (along the trail from there to the Savanna East of Nakum).

I must admit that my hikes aided by Q'eqchi' Mayan plant scout Senaida Ba into remote areas of Alta Verapaz have also been amazing; I never expected to find wild vanilla orchids at high elevations: in Petén, yes (they are everywhere in Parque Nacional Yaxha, Nakum y Naranjo) and we found wild vanilla orchid vines "everywhere" in the Municipio de Livingston. Many were at an elevation, literally, of only a few meters above sea level (because they were growing from the seasonal swamps parallel to El Golfete area of Río Dulce which is only a few meters or so above sea level). But the flora and fauna of Petén, and now, every month, I am inspired to study the biodiversity of the Municipio de Livingston, Izabal, Guatemala.

Sorry to get personal, but Guatemala is an amazing place to work together with local people to learn about Neotropical flora and fauna of Mesoamérica.

Photo credits on page #47

PHOTO CREDITS FROM PAGE 13

Photo by: Nicholas Helmuth, FLAAR Mesoamerica, Mar. 1, 2016, 9:35 am. Río Icbolay, Guatemala.

Camera: Nikon D810. Lens: Nikon AF-S NIKKOR 400mm FL ED VR. Settings: 1/250 sec; f/5.6; ISO 640.

PHOTO CREDITS FROM PAGE 14

Photo by: Nicholas Helmuth, FLAAR Mesoamerica, Dec. 10, 2015, 4:24 pm. El Estor, Guatemala.

Camera: Nikon D810. Lens: Nikon 200mm AF-D Tele-Macro. Settings: 1/80 sec; f/8; ISO 1,250.

PHOTO CREDITS FROM PAGE 15

Photo by: Nicholas Helmuth, FLAAR Mesoamerica, Feb. 11, 2018, 4:15 pm. Río Polochic, Guatemala.

Camera: Nikon D5. Lens: Nikon AF-S NIKKOR 400mm FL ED VR. Settings: 1/500 sec; f/7.1; ISO 1,000.

PHOTO CREDITS FROM PAGE 19

Photo by: Erick Flores, FLAAR Mesoamerica, Sep. 6, 2018, 2:21 pm. Yaxhá-Nakum-Naranjo, Petén, Guatemala.

Camera: Canon 1D X Mark II. Lens: Canon EF 300mm IS II USM. Settings: 1/125 sec; f/3.5; ISO 200.

PHOTO CREDITS FROM PAGE 24

Photo by: David Arrivillaga, FLAAR Mesoamerica, Feb. 6, 2020, 11:04 am. Milpas Altas, Guatemala.

Camera: Canon T3i. Lens: Canon 55mm f/3.5. Settings: 1/250 sec; f/4; ISO 200.

PHOTO CREDITS FROM PAGE 28

Photo by: Nicholas Helmuth, FLAAR Mesoamerica, Sep. 5, 2018, 10:49 am. Yaxhá-Nakum-Naranjo, Petén, Guatemala.

Camera: Nikon D810. Lens: Nikon AF-S NIKKOR 600mm FL ED VR. Settings: 1/40 sec; f/10; ISO 3,200.

PHOTO CREDITS FROM PAGE 29

Photo by: Nicholas Hellmuth, FLAAR Mesoamerica, Feb. 11, 2018, Río Polochic, Alta Verapaz.

Camera: Nikon D5. Lens: Nikon AF-S NIKKOR 600mm FL ED VR. Settings: 1/500 sec; f/7.1; ISO 1,000.

PHOTO CREDITS FROM PAGE 30

Photo by: Erick Flores, FLAAR Mesoamerica, Aug. 18, 2018, 12:41 pm. Yaxhá-Nakum-Naranjo, Petén, Guatemala.

Camera: Canon 1D X Mark II. Lens: Canon EF 300mm IS II USM. Settings: 1/1,600 sec; f/5.6; ISO 640.

PHOTO CREDITS FROM PAGE 31

Photo by: Nicholas Helmuth, FLAAR Mesoamerica, Mar. 1, 2016, 9:35 am. Río Icbolay, Guatemala.

Camera: Nikon D810. Lens: Nikon AF-S NIKKOR 400mm FL ED VR. Settings: 1/250 sec; f/5.6; ISO 500.

PHOTO CREDITS FROM PAGE 31

Photo by: David Arrivillaga, FLAAR Mesoamerica, Jun. 24, 2021, 8:35 am. Río Icbolay, Guatemala.

Camera: Sony Alpha A9 II. Lens: Sony FE 200-600mm G OSS. Settings: 1/1,250 sec; f/6.3; ISO 1,600.

PHOTO CREDITS FROM BACK COVER

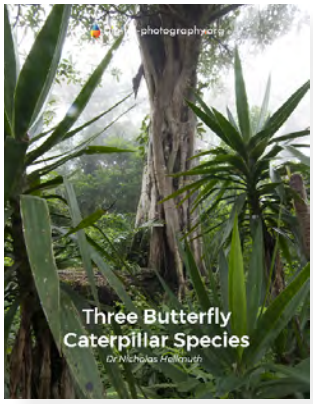
Photo by: Nicholas Helmuth, FLAAR Mesoamerica, Nov. 4, 2016, 3:17 pm. Telemán, Alta Verapaz.

Camera: Nikon D5. Lens: Nikon AF-S NIKKOR 400mm FL ED VR. Settings: 1/125 sec; f/11; ISO 6,400.

OTHER PUBLICATIONS OF
THE FAUNA OF GUATEMALA

Friendly Foxes in Yaxha
Download here

Rescate, Crianza Liberación y Reincersión de dos crias de Coaties
Download here

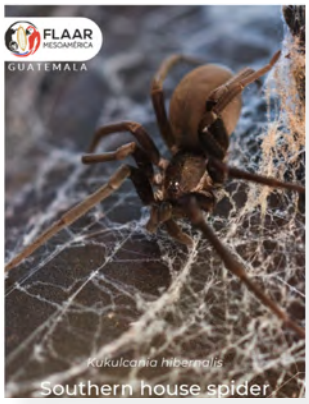


Three Butterfly Caterpillar Species
Download here

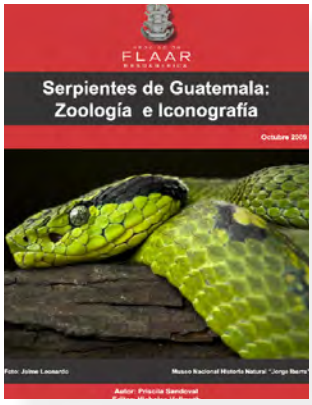
Spider Wrapping Prey Guatemala City
Download here

Argiope Spider
Download here

Native Honey bees at Yaxha
Download here



Southern house spider
Download here



Serpientes de Guatemala
Download here

Photographing Birds
Download here

If you wish more FLAAR reports on fauna of Guatemala,
visit our website:
www.maya-ethnozoology.org.

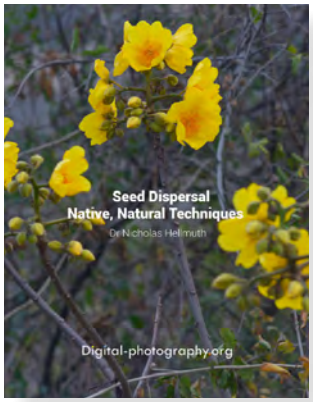
OTHER PUBLICATIONS OF
THE FLORA OF GUATEMALA

Pontederia Cordata
Download here

Montrichardia arborescens
Download here

***Sagittaria* Species**
Download here

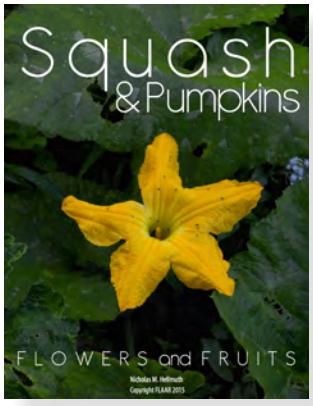
Manitas tree
Download here



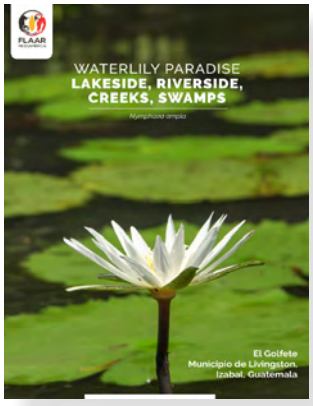
Seed Dispersal Native, Natural Techniques
Download here

Bright Red & Yellow Bromeliad Flowers
Download here

Tree Flowering
Download here



Squash & Pumpkins
Download here

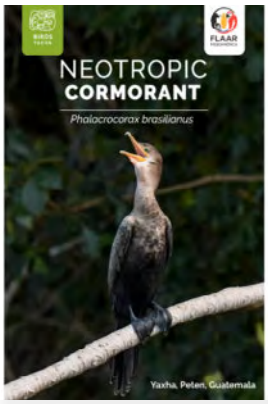


Waterlily Paradise
Download here

If you wish more FLAAR reports on flora of Guatemala,
visit our website:
www.maya-ethnobotany.org.

OTHER PUBLICATIONS FROM NATIONAL PARK YAXHA, NAKUM AND NARANJO, GUATEMALA

La Hora Dorada Oportunidades Fotográficas
Download here



Neotropic Cormorant
Download here

Garcita Blanca
Download here

Isla del Musgo
Download here

Cactus de los Árboles
Download here

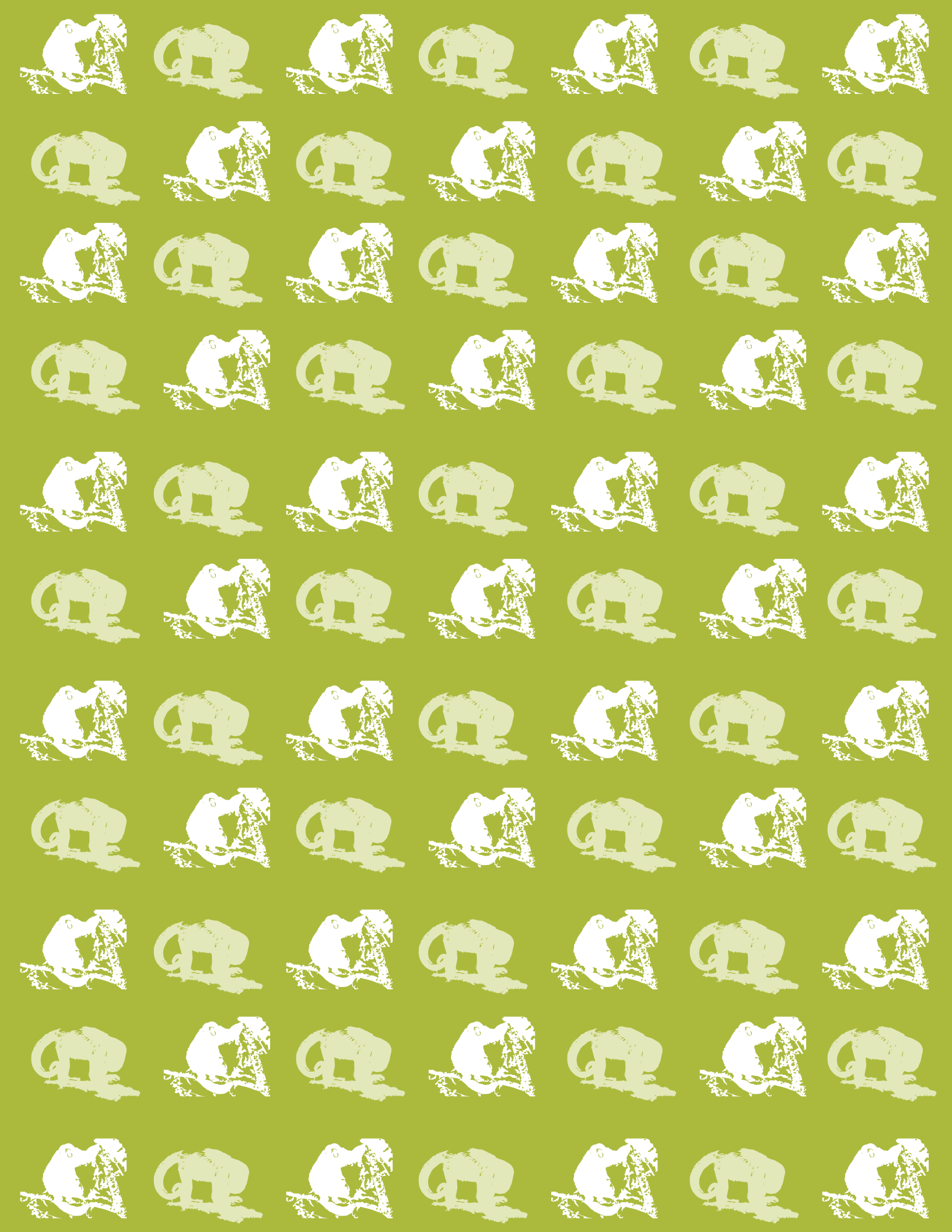
Hoja de Piedra
Download here

Spider Monkey
Download here

Aquatic Orchids?
Download here

Garza Blanca
Download here

If you wish more FLAAR reports on flora of Guatemala, visit our website:
https://flaar-mesoamerica.org/projects-national-park-yaxha-nakum-naranjo/




FLAAR
MESOAMÉRICA