

**The point of sloths is to bring a sense of wonder, magic and happiness to all other species.**

Ann Burton

### Brown-throated 3-toed Sloth



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### Hoffmann's 2-toed Sloth



**Every move a sloth makes is with purpose, which is more than most of us can say about 90% of the time.**

Ann Burton

**Canadian Organization for Tropical Education  
& Rainforest Conservation**





**For many people, sloths are charismatic creatures.** Maybe it's their Mona Lisa smile. Maybe it's their relaxed way of moving around. Or maybe it's their undeniable cuteness.

Yet that's surface stuff. When you look at their entire lifestyle, their adaptations for their topsy-turvy world, and their evolutionary history, many surprises await. For example, they don't thermoregulate like most other mammals do. The great majority of their ancestors didn't live in trees. And they don't move with any speed – though the incident described at right shows they can speed up if they have sufficient motivation, whatever that may be.

So, starting on Page 5, we'll take a look at the evolutionary history of sloths plus their adaptations for a low-energy lifestyle. And, in the Winter issue, we'll check out one of the most amazing things about the sloth families. That would be their.... Well, you'll just have to wait till January for that.

*It's impossible to go to Caño Palma without witnessing something unusual. This anecdote from station manager Charlotte is taken from the Fall 2012 issue of Raphia.*

Things have been moving on base as well - at least the wildlife has. We had not one but two sloths CHARGING through the station garden, defying their name and reputation!

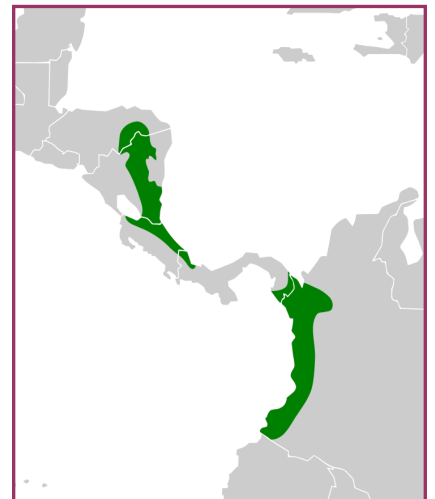
One was apparently in pursuit of the other as, when they made contact, the leader appeared to be hurled to the ground. Stunned, the sloth remained frozen for long enough for everyone to get their cameras, take some novel shots, and have a coffee.

Eventually, the wounded party made its way to the closest sapling, but was unfortunately not up to the task. After breaking two saplings and falling from a bromeliad post, it started to climb onto the office balcony. At this point we stepped in, with gloves, and assisted it to a sturdy tree at the edge of the jungle. Meanwhile its pursuer hung out in the breadfruit tree with a grin that made it appear to be quite enjoying the show!

**Correction** - The last issue of Raphia had an article about the fulvous-bellied antpitta by former station manager Ross Ballard. This antpitta was later split into two species, and our local species was renamed the **thicket antpitta** (*Myrmothera dives*), whose range is shown on the map. Some people received that issue with an incorrect identification.



**Thicket  
Antpitta**





# Biking For Solar Panels



Unfortunately, downed trees are a common occurrence in the Tortuguero area, often taking down power lines. That's one of the many reasons that Caño Palma is working toward installing solar panels in the near future! That and the climate crisis. Go clean energy!

In pursuit of that goal of outfitting the station with solar panels, we will be holding an online fundraising event on November 19th. Stayed tuned for further details.

Another way to help Caño Palma towards our goal of installing solar panels is to support Alain and Dan in their epic ride from London to Bangkok. Dan Cresswell, an alum of the station, let us know that he and Alain have two goals: completing the journey and fundraising along the way to help us towards the purchase of those solar panels. We could not be more honoured.

You too can do two things: first, follow Alain and Dan's incredible journey at [@djresswe11](#). And secondly, if you're able to donate to help us go solar, please visit <http://www.coterc.com/donations.html> to make a donation. Every bit helps.



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## So Many Gateways To Learning by Ashlynn Pfau

Hello! My name is Ashlynn Pfau and I'm going into my 3<sup>rd</sup> year at Shawnee State University in Portsmouth, Ohio. I'll graduate next spring with a degree in Natural Sciences (Biology) and a minor in Environmental Life Science. After graduation, I want to do conservation fieldwork, working in a national or state park, preferably being a naturalist or an educator with my love of nature. I'm originally from West Portsmouth, growing up with the forest in my backyard.

Q 1 - What did you like about life at Caño Palma?

The simplicity and the community. I joke with my friends and family that it was like a community and once you got your work done, you had some free time to do what you wanted. Getting to know people from all around the world and from different cultures was also eye-opening, allowing me to see the bigger picture and how vast our lovely planet is.

Q 2 - What were the biggest adjustments you had to make in order to live in a remote rainforest?

Sweat. At home, I would never be able to sleep in the summer without A/C and a fan blowing on me. However, the rainforest is not kind when it comes to humidity and heat. Another thing, for the first few days, I wore shoes everywhere and looked around a lot to make sure nothing was there to get me. However, I joke that we southern Ohioans are a different breed and by the time a few days had passed, I was walking on the sidewalks and all around the station barefoot.

Q 3 - Was there anything you learned about yourself that surprised you?

That my body could take more than I thought. Night patrols were especially rough as you're walking up to 10 miles on the beach in complete darkness from 10 pm to 3 am. I am not a morning person and am in bed by 9:30 every night back at home. So, being able to do this and keep going really showed me that I could push myself. I also realized just how much I love the arts. I've always had a connection with them, but this experience helped me to slow down and participate in things I truly wanted to do, which I found most of the time to be photography, painting and reading. It showed me that when I'm able to put all the electronics and expectations of daily life away, what I truly wanted to do was relax and indulge in the simple things.

Q 4 - What were some of your favorite places at the station?

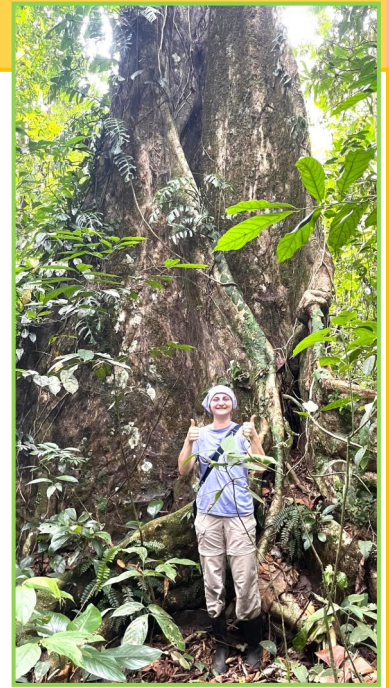
My all-time favorite spot was the dock. During hot periods of the day, going out there to read and laying on the cold concrete was incredibly relaxing. Another favorite was the mural my classmates and I worked on. I found myself indulging in creating art, which I felt like I haven't had a whole lot of time to do back home.

Q 5 - Would your experience at the station affect your future plans?

I think so. As a young adult, I'm always back and forth about what I want to do in the future. This experience has directed me towards a future that focuses more on conservation. I want to participate in more fieldwork while I'm young, and also travel everywhere to get to see all the beautiful things Earth has to offer.

Q 6 - What memories of Caño Palma will you carry with you for a long time?

A few memories stand out, such as a classmate falling through a bunk bed on our first day and some Capuchin monkeys getting angry at us. More than that though, it will be feelings. When I think about my time there, it plays like a slideshow in my head with the overall feeling of peace and fulfillment. Being at Caño Palma helped me slow down and realize that I prefer a much slower and simpler life than the one that's pushed in the U.S. I will forever hold this research base close to my heart.





## The Surprising Evolutionary History of Sloths by Doug Durno

Sloths are one of the largest mammals to have ever cavorted round this old Earth of ours.

Sloths, you say, skeptically? Aren't sloths about the size of dogs? Don't they live in trees?

You're right if you're just considering the sloths you know from Costa Rica and elsewhere in the tropics. They're fairly small, weighing from 4 to 9 kg (9 to 20 lbs) with lengths of 60 to 80 cm (24 to 31"), similar to a medium-sized dog.

So, what's this about sloths being large animals?

Let's go back to the beginning when sloths first came on the scene almost 38 million years ago. They emerged from the superorder Xenarthra, a group that also includes armadillos and anteaters. Sloths roamed around South America until they were able to reach Central and North America with the formation of the Isthmus of Panama around 3 million years ago. In fact, Xenarthrans including sloths were among the most successful of all South American invaders to cross the Isthmus.

Sloth evolution generally trended towards larger body sizes. How big were they? *Megatherium americanum* was the size of an elephant, weighing up to 4 tonnes with a length of 6 meters. The 5-tonne *Eremotherium eomigrans* had claws up to a foot long. Of the 7 different sloth families, 4 had at least one species that weighed over 1000 kg. They'd be more likely to be knocking down a tree than climbing one.

So far, scientists have identified over 100 species of now-extinct sloths, almost all ground-dwelling. A few were smaller than the 6 tree-dwelling species of 2-toed and 3-toed sloths that survive today. However, most were the size and shape of a large bear with powerful forelimbs that had prominent curved claws, well suited for handling the leaves and fruit they ate.

Ancient sloths evolved along many paths including:

**Marine sloths** - A few sloths were at least semi-aquatic, feeding on seagrasses in ocean shallows.

**Armadillo-like sloths** - Some giant ground sloths were covered in bony, armored plates, much like their relatives, the armadillos.

**Burrowing sloths** - Thousands of burrow networks dug out by many generations of now-extinct sloths have been discovered. Sloths, including the huge *M. americanum* noted above, had the claws for digging these paleoburrows, which can reach up to 600 meters long.

**Bipedal sloths** - Fossil morphology and tracks suggest that some extinct sloths could walk bipedally. They at least stood on their hindlegs to reach up into trees for leaves.

But all this diversity came to an end - except for the arboreal sloths we know and love today. That tale will be in the next issue of *Raphia*.

### References

<http://blogs.biomedcentral.com/bmcseriesblog/2014/09/10/slothful-trends-in-evolution-from-walking-giants-to-tiny-tree-dwellers/>

<http://academics.wellesley.edu/Biology/Faculty/Emily/EvolutionDevelopment2009.pdf>

<https://www.sciencealert.com/this-massive-tunnel-in-south-america-was-dug-by-ancient-mega-sloths>

<https://en.wikipedia.org/wiki/Sloth>

<https://www.researchgate.net/publication/265488906>

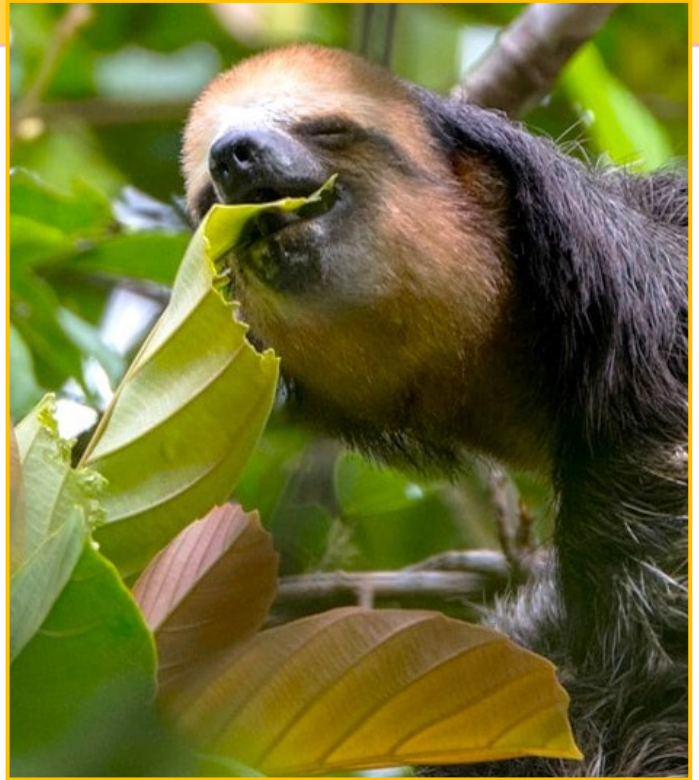
Complex body size trends in the evolution of sloths *Xenarthra Pilosa*

## You Are What You Eat -- Sloth Adaptations For a Low-Energy Lifestyle by Doug Durno

"You are what you eat". That could have been coined to apply to sloths. For the most part, sloths eat leaves. Leaves don't provide much nutrition. And sloths digest food so slowly that it limits the speed with which they can acquire energy. So, how have sloths evolved to accommodate such a low-energy diet? Let's look at some of their energy-saving adaptations:

**Body temperature** - We humans, like most mammals, can regulate our body temperature, which enables us to live in both cold and warm climates. It comes at a cost though - it requires a lot of energy to thermoregulate. Sloths save that energy by greatly reducing thermoregulating. While we maintain a constant body temperature, the core temperature of sloths can fluctuate 10 to 18° during a day. Like ectotherms, they'll bask in the morning sun to warm up and keep to shady areas when the day heats up. It also means that their range is restricted to the tropics.

**Low muscle mass** - Pull-up champs - Present-day sloths have evolved to mainly retain flexor muscles used for the pulling, grasping and hanging required for their upside-down lifestyle. To a great extent, they've eliminated extensor muscles, muscles used for pushing. Why bother carting around, maintaining and wasting energy on muscles they rarely need? So,



while most mammals have a muscle mass that constitutes 40 to 45% of their body weight, sloths ring in at only 25%. As muscles are metabolically expensive, this decreases their metabolic rate considerably.

**Metabolic rate** - Sloths have one of the lowest metabolic rates of any non-hibernating mammal. It's less than half of what would be expected in a mammal of their size. As well as having less muscle mass, this low rate is achieved by lowering their metabolism as ambient temperatures decrease. And, unique among mammals, they can apparently also reduce their metabolism when it's too hot.

**Hanging** - When upside-down, specialized tendons lock a sloth's curved claws onto the branch (as at left). So, hanging requires no energy. Bats have the same adaptation.

**Balance** - Though we may not realize it, the act of standing requires energy. Hanging upside-down with claws locked onto a branch saves that energy.



Claws locked on

(cont'd on next page)

## You Are What You Eat (cont'd)

**Locomotion** - Makes sense. If you don't move about much and your pace is slow-motion slow, you save energy.

**Food** - With leaves being plentiful in their arboreal homes, sloths don't usually have to spend much energy searching for a meal. Plus, with a slow metabolic rate, sloths require less food and can spend more time resting.

**Sleep/Inactivity** - Lots of energy saved here. One study in Costa Rica found that sloths are inactive 72-85% of the time. About three-quarters of their inactive periods was sleep.

During periods of inactivity, sloths also save energy by



Two-toed sloths have 23 pairs of ribs (as shown above), the largest number of any mammal. African elephants have 21 pairs, humans have 12, whales have 9. The two-toed's ribs are quite flexible, which provides protection when they fall from a tree - which they do.

I'll let you in on a secret. All sloths, whether they're called two-toed or three-toed, have three toes on their hind feet. Their names are based on the number of toes on their front feet.

maintaining a lower heart rate and reducing their body temperature.

**Ribs** - When upside-down, their abdominal organs would apply pressure to their lungs. Breathing issues would ensue. However, the pressure's eliminated by adhesions that attach the organs to their ribs, and energy is saved.

**Vertebrae** - All mammals have 7 neck (cervical) vertebrae - almost all. Sloths and manatees are exceptions. Three-toed sloths have 8 or 9 cervical vertebrae, which allows the neck greater flexibility so that they can rotate their heads 270°. That means they can fetch a leaf by simply pivoting their head rather than their entire body, thus saving some energy. On the other hand, two-toeds have shortened, thickly muscled necks with 5 to 7 vertebrae. When upside-down, this reduces the energy needed to support the head.

**Solitary Lifestyle** - Sloths don't waste energy on social interactions or maintaining a large territory.

Now for a mind-blowing declaration: The two genera of arboreal sloths evolved these energy-saving adaptations and many other adaptations for an upside-down life independently from one another. Watch for the Winter issue of *Raphia* and this remarkable story.

### References

<https://slothconservation.org/newly-published-sloths-extraordinary-metabolic-response-temperature/>

<http://www.slothville.com/what-is-a-sloth/>

<https://www.sciencedaily.com/releases/2011/05/110505212314.htm>



## Sloths Still Alive Today

Superfamily Megatherioidea

**Bradypodidae** - Family of three-toed sloths - 4 extant species:

**Brown-throated three-toed sloth** (*Bradypus variegatus*) - They have the largest range of extant sloths. Inhabit the forests of South and Central America. **Found in our area.** (Least Concern)

**Pale-throated three-toed sloth** (*Bradypus tridactylus*) - Inhabits tropical rainforests in northern South America. It's similar in appearance to the brown-throated, which has a much wider distribution. (Least Concern)

**Maned three-toed sloth** (*Bradypus torquatus*) - Found only in the Atlantic Forest of southeastern Brazil. (**Vulnerable**)

**Pygmy three-toed sloth** (*Bradypus pygmaeus*) - Endemic to the small island of Isla Escudo de Veraguas off the coast of Panama. (**Critically Endangered**)

Superfamily Mylodontoidea

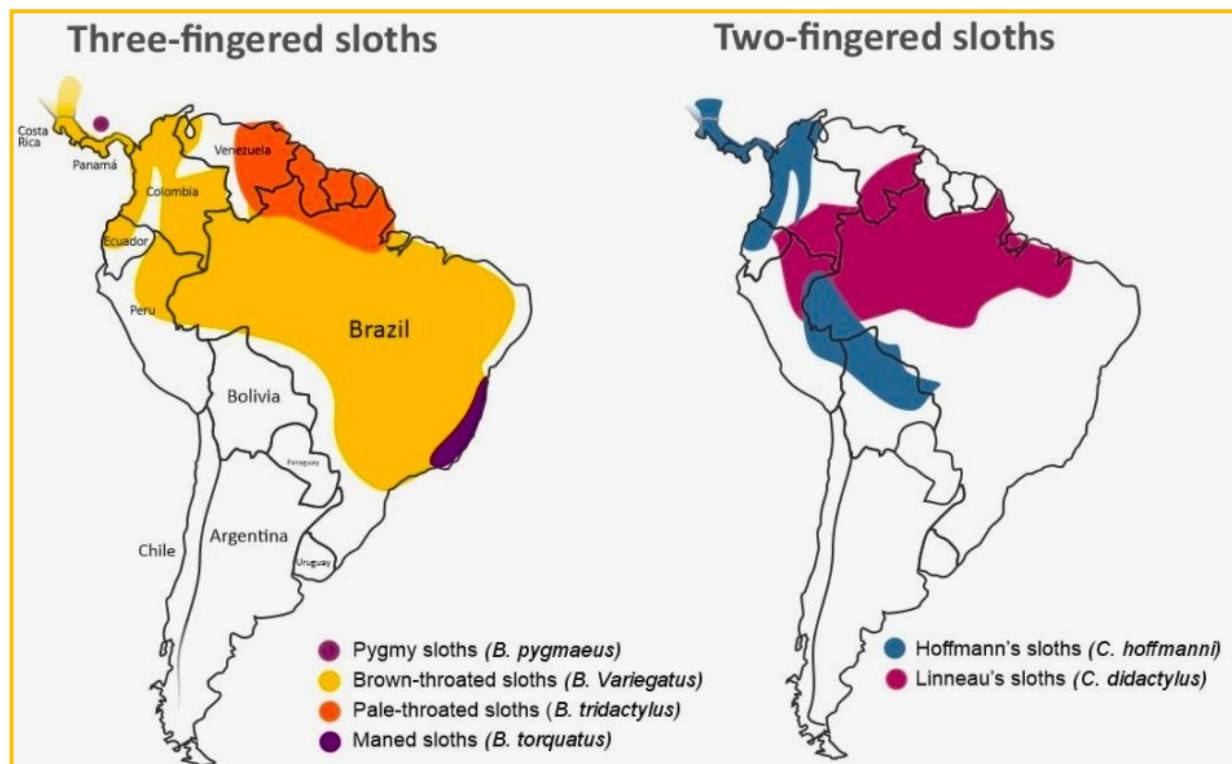
**Choloepodidae** - Family of two-toed sloths - 2 extant species:

**Linnaeus's two-toed sloth** (*Choloepus didactylus*) - Found in Venezuela, the Guianas, Colombia, Ecuador, Peru and Brazil north of the Amazon River. (Least Concern)

**Hoffmann's two-toed sloth** (*Choloepus hoffmanni*) - Inhabits tropical forests and generally favors the canopy. It has two separate ranges, split by the Andes. One population is found from eastern Honduras in the north to western Ecuador in the south. The other is in eastern Peru, western Brazil and northern Bolivia. **Found in our area.** (Least Concern)

### Reference

<https://ideas.ted.com/in-search-of-the-rare-and-ridiculously-cute-pygmy-sloth/>





## Notes from the Station by Charlotte Foale

A crazy busy season is drawing to an end, and we've been able to share it with some amazing people. In August, we said a very sad farewell to 3 outstanding long-term interns: Lydia Cresswell, Georgie Clarke and Ryan Jack.

Georgie and Lydia both came to us for year-long internships from the UK as part of their universities' industrial placements and became indispensable in all aspects of station life. Ryan was here for 3 months...then 6...then 9, just gaining post-grad experience and inspiring us with his passion for ornithology and dedication to learning and sharing about the local bird population. They all became phenomenal leaders, both in the field and on base, and great friends to us all.

We didn't have time to mourn for long because they had barely left when we hosted a group from the University of Kent's Durrell Institute of Conservation and Ecology (DICE). This is our second year receiving DICE students and they were a phenomenal group. 20 students, led by the intrepid Drs. Bicknell and Pheasey, worked day and night to get as much experience as possible in their short time here. One of them just couldn't get enough and came back for an additional two weeks. This year's group impressed us as much as last year's with their enthusiasm, dedication and application, and we really hope that some of them will make it back. Throughout the year we've had several visits from Dr. Bernal Rodriguez and his students from Universidad de

Costa Rica. Bernal, as one of the authors of the field guide to tent-making bats in Costa Rica, has been looking in on some of the less-documented species we have on base as well as discussing ideas for his

Masters students to use our current data and collect additional information about the abundant tent-making bat population we have at Caño Palma. With a second year of high turtle numbers and so much else to study, I cannot express enough thanks to all of the interns and volunteers we've had on base helping with every aspect of the work. Of course, they would have been lost without the support and dedication of our Turtle Coordinator Marika Breton and Research Coordinator Nathan Delmas. They've put in some incredible hours to make sure that everything has been running smoothly on base and that all of the reports and permits that our research requires are in on time. We are incredibly grateful to have such a great team!



## Notes from the Chair by Dr Kym Snarr

### Save the date - Sunday November 19th....

I basically want to say how well the station is doing and reflect on our 2000+ visitors who have come to learn and assist in our conservation and research since the station's inception! Over those 32 years, we have had a wide variety of station managers and research coordinators (formerly known as scientific officers) who have come through, helping to shape infrastructure and research projects. Our current team of station manager, Charlotte Foale, and long-term monitoring-project lead, Manuel Arias, have been on the ground since 2013.

They have helped stabilize Caño Palma by improving our infrastructure, program management, and data quality. Our current Research Coordinator, Nathan Delmas, has kept the long-term projects going while supervising undergraduate students and volunteers as well as working with local communities and the Costa Rican government to promote conservation. As well, Turtle Coordinator Marika Breton has been putting in a lot of effort during a very busy and stressful turtle season.

These four and the Board of COTERC have been working to keep pace with newer technology and how best to keep the station functioning well so that all interns and visitors to the station have the immersive learning experience that is at

the heart of what we do!

Which brings me to my point - To help keep the station running, constant connectivity is a requirement for the current era. Whereas in the early years, faxes may have had to be sent from larger centres distant from the station, in today's conservation work, electricity and internet connectivity are necessary for a multitude of reasons. We are striving to meet our current needs with the installation of a solar backup system.

But a solar system that will meet the station's needs doesn't come cheap. That's why, on Sunday, November 19th, we are bringing back our Fiesta Verde - the online version! Save this date!! With more details to come, we welcome you to come catch up on station happenings, what has become of former staff and interns, and meet new COTERC Board members who put in volunteer hours to keep the station fiscally and scientifically sound. It is a fundraiser and we are hoping that those who can contribute will. Gather your friends and family to watch together at your own home or institution to enjoy learning about or reminiscing about the station or your time with COTERC.





## Pit-Tag Beginnings at Caño Palma by Elias Bader

*Elias Bader was station manager at Caño Palma in 2013-14. The original article can be found in the Winter 2014 issue of *Raphia* at [vol 23 issue 1 yr 2014.pdf \(coterc.com\)](#)*

Studying snakes in the wild has always been a challenge. Snakes are often fast, well camouflaged, and quite homogeneous in colour within a population, a combination that makes investigating their habits a Herculean task. With its speed, a specimen is often only spotted the moment it disappears. Even if you get more than just a glimpse of the animal, a lack of colour variation within a species will leave you in the dark as to whether the animal you saw this time was the same one you previously caught.

So, recognition of individuals by sight remains mostly impossible. To answer many ecological questions, however, individual recognition is indispensable. In other taxa that face the same problem, the use of numbered collars, radio transmitters or coloured rings have led to successful outcomes.

But, as we all know, snakes do not have legs to put bands on, nor do their anatomy and feeding behaviour allow a researcher to put a collar or radio transmitter around their neck. Snake researchers have had to find other ways to mark their animals, which meant branding or clipping some nicks into a snake's ventral scales. Both methods, though useful in short-term studies, have the disadvantage that, after a few sheddings, these marks disappear. Thus field studies on snakes were often impractical.



However, technology has advanced. One invention useful to snake researchers is PIT tags. These microchips, only the size of a grain of rice, can be injected into a snake's body cavity, equipped with a unique numeric code that makes each individual identifiable. It's the same technology used to identify our pets such as dogs. As well, these tags are often used to replace branding to identify cattle. "Essentially, PIT tags act as a lifetime barcode for an individual animal, analogous to a Social Security number and ... are as reliable as a fingerprint."

At Caño Palma, after basic information like species, age and sex is determined, and body measurements such as length and weight are taken, a PIT tag is then

implanted into the snake's body cavity.

Thereafter, every time we recapture a tagged snake, we can figure out its growth rate since its last capture. Together with the previously recorded encounter coordinates, we're able to calculate an individual snake's movement patterns. And last but not least, the ratio of recaptured to yet unmarked indi-

viduals allows us to estimate the population size of a species in the area of Caño Palma. All that's required is a PIT-tag reader.

In the tropics, as of 2014, no snake studies using PIT tags have been published. We're proud to be pioneers in this research field.

PIT = Passive Integrated Transponder.

## Station Happenings by Nathan Delmas, Research Coordinator

**July** **Dr Bernal Rodriguez Herrera** from the Universidad de Costa Rica again led student groups to the station, visiting twice this month. With their focus on bats, they captured a few Peters's disk-winged bats (*Thyroptera discifera*), and put microtransmitters on their backs to track their movements and find the shelters they use during the day.

**Peters's disk-winged bats** - A distinguishing feature is a circular suction disk at the base of their thumbs and hind feet. They use these suction disks to cling onto young, unfurling banana or heliconia leaves to roost while avoiding rain and predators. They're distributed from Nicaragua south to Bolivia and eastern Brazil, inhabiting lowland secondary and semi-deciduous forests.

**Tent-making bats** - Over 8 tent-making bat surveys, we checked 379 tents for their condition, presence of bats, and signs of foraging and feces. We observed 63 bats. There were 15 new tents and 12 tents died. 28 tents showed evidence of foraging and we found bat feces under 148 tents.

**Surveys** - As July is a rainy month, animal sightings were down on surveys. However, it was a very busy month for turtles as you'll note in Marika's turtle report.

**Personnel** - **Laurianne Richard** from the Université du Québec à Rimouski, who worked at the station for a few months in 2022, returned to help out as turtle coordinator. She will be gathering additional excavation data for her Masters work on embryo development in hawksbills.

Working as turtle interns were the following marine or general biology students:

- **Melanie Morford** - University of Maryland.
- **Kate Bulger** - University of St Andrews in Scotland.
- **Marissa Reddy** - California Polytechnic State University. Marissa will be looking into the micropredation of turtle eggs and rainfall.
- **Rachel Edworthy** - University of Exeter in England.

**Filipo Andruccioli**, from Italy, is also a returnee, having been a patrol leader for the turtle project in 2021.

**Thomas Russo** from France joined us as a mixed-taxa intern.

A thank you to **Paul, Joselyn and Tony** who helped at the school for a week as well as participating in surveys.

**August** With turtle season at its peak, other surveys had to be reduced. We did have another visit from **Dr Rodriguez Herrera's** bat-seeking group. Again, their specific target is *Thyroptera discifera*. We managed to find more individuals to track their movements, determine their home range, and understand how they use the forest, e.g. shelters, food sources.

**Marijn van Doorn** - He joined us from Van Hall Larenstein University in the Netherlands where he's studying Coastal & Sea Management.

**Rhys Reynolds and Megan Davies** - Both are doing their Bachelors in Marine Geography at Cardiff University in Wales. Rhys is working on a project regarding otters and caimans as keystone species for ecosystem health. Megan is studying the relation between incubation temperature and sex ratio in green-turtle nests.

**Annie van Kessel** joined us from Switzerland as a turtle intern for personal interest and experience.

**Poachers** - A family of known poachers who lived at the mouth of the river moved back into San Francisco. We'll closely monitor the impact this event has on the number of nests poached nearby. We've already observed a massive drop in dog tracks in the Cerro.



## Station Happenings (cont'd)

### September

**Great green macaws** - Though 8 surveys were carried out this month, there were no sightings of great green macaws. Most of the local macaws migrate to Nicaragua in September so we won't see them too much till November.

**Eastern Kingbirds** - Though no great green macaws were observed, eastern kingbirds were plentiful. An estimated 200,000 were observed during their migration southward to their wintering range in South America.

**Durrell Institute of Conservation and Ecology (DICE)** - Students from this research center at Kent University in England spent a very intense week at Caño Palma. This is the second DICE group to visit the station under the leadership of Dr Jake Bicknell and Dr Helen Pheasey, a former sea-turtle-monitoring project manager at Caño Palma.

**Personnel - Ralf Verkleij**, from HAS University in the Netherlands, will be doing his internship on the effect of the ENSO on green turtles. (ENSO is the El Niño-Southern Oscillation, an irregular, recurring weather pattern involving changes in sea-surface temperatures and winds that affect the climate in the central and eastern tropical Pacific Ocean. The warming phase is called El Niño.)

**Renske Steegman**, from Van Hall Larenstein University in the Netherlands, will work on the impact of tourism on mammal communities in our area.

**Siebe Van Merm**, also from VHL, will be doing research on turtle health vs nest productivity.

**Georgie Lander**, from Plymouth University in England, will be doing her placement year with us, working on the turtle project.

**Anna Heslop**, from Wales, came to the station as a volunteer to gain some insight when it comes to conservation work in the field.

## Turtle Report by Marika Breton, Turtle Project Coordinator

### June

The start of the nesting season saw a 4-fold increase over last year. There were 52 nests vs 13 in 2022. Green and hawksbill nesting accounted for almost all of this.

### July

July was an unusually active month for green turtles along Playa Norte. This species doesn't normally peak until late August and early September. This suggests an early nesting season or an important peak year for green-turtle activity on our beach.

Nesting activity - July	2022	2023
<b>Leatherback</b> ( <i>Dermochelys coriacea</i> )	0	0
<b>Green</b> ( <i>Chelonia mydas</i> )	52	194
<b>Hawksbill</b> ( <i>Eretmochelys imbricata</i> )	11	7
<b>Loggerhead</b> ( <i>Caretta caretta</i> )	0	0
<b>Total</b>	63	201

### Note

- Leatherback nesting season is usually finished by the end of May.
- Loggerheads - It's unusual to find this species on Playa Norte.

## Turtle Report by Marika Breton

### August

Nesting activity - August	2022	2023
<b>Leatherback</b> ( <i>Dermochelys coriacea</i> )	<b>0</b>	<b>0</b>
<b>Green</b> ( <i>Chelonia mydas</i> )	<b>289</b>	<b>317</b>
<b>Hawksbill</b> ( <i>Eretmochelys imbricata</i> )	<b>7</b>	<b>5</b>
<b>Loggerhead</b> ( <i>Caretta caretta</i> )	<b>0</b>	<b>0</b>
<b>Total</b>	<b>296</b>	<b>322</b>

In total, there were 974 emergence events this month. That broke down as 322 nests and 653 halfmoons.

Nesting activity was pretty constant throughout the month with 10 or more nests and a significant number of halfmoons most nights. That's unusual as high green-turtle activity historically peaks in late August and early September. That supports the idea that this might be an early nesting season or an important peak year for green-turtle activity on Playa Norte.

### Poaching

Lifts - Five likely this month - 4 green and 1 hawksbill.

Poached nests - 31 green nests were completely poached plus there were a further 29 attempts. We also suspect poaching of 18 more nests as we could not find any eggs when we went back for mesh placement or excavation.

### Total Nesting Activity for June, July and August

The table below shows a 54% increase in nesting so far in the 2023 turtle season.

Such a busy and successful season required a lot of effort and sweat by the people involved in patrolling the beach. Thanks to all.

And congrats to Marika for her hard work in organizing all the training and beach activity.

Total nesting - June, July, August	2022	2023
<b>Leatherback</b> ( <i>Dermochelys coriacea</i> )	<b>0</b>	<b>1</b>
<b>Green</b> ( <i>Chelonia mydas</i> )	<b>348</b>	<b>543</b>
<b>Hawksbill</b> ( <i>Eretmochelys imbricata</i> )	<b>24</b>	<b>30</b>
<b>Loggerhead</b> ( <i>Caretta caretta</i> )	<b>0</b>	<b>1</b>
<b>Total</b>	<b>372</b>	<b>575</b>



## Guatemala: How To Undo An Election by Doug Durno

Drug trafficking, gangs, rights violations, and corruption in every corner of government have long plagued Guatemala. Combined with poverty, this has resulted in Guatemala having the second-largest number of emigrants to the USA in recent years.

Jimmy Morales had a slogan when he won Guatemala's presidency in 2016 - "*Ni corrupto, ni ladrón*" ("Neither corrupt, nor a thief"). Of course, he turned out to be both. His successor in 2020, Alejandro Giammattei, carried on the tradition. In a contemporaneous poll, less than 3% of Guatemalans rated his administration as 'good'. A U.N. effort to combat graft was shut down by Giammattei as he forced out the prosecutors and judges involved.

This year's election promised more of the same. Giammattei's administration, besides packing the courts with loyalists, stacked the Electoral Tribunal with people who could be counted on to prevent a reformer from winning the presidency. On trumped-up charges, they barred 3 popular candidates from running. They were hoping that their candidates would win the first two places in the election, thus giving them control of the runoff that takes place if no individual receives 50% of the vote.

June 25<sup>th</sup> - Election Day - The establishment candidate, Sandra Torres, won - but with only 21% of the vote. That meant a runoff between Torres and the second-place finisher Bernardo Arévalo, a reformer, who got 15% of votes cast.

Uh-oh. Reformers can't be allowed. Quickly, the country's attorney general suspended Arévalo's party, Movimiento Semilla (Seed Movement), for allegedly violating election laws. Prosecutors raided the offices of the Electoral Tribunal who had certi-



**Bernardo Arévalo**

fied the election results. Surprisingly, the Constitutional Court backed the Electoral Tribunal and the race was on.

Arévalo ran as the outsider, focusing on corruption.

August 20<sup>th</sup> - Runoff - Surprise. Arévalo wins in a landslide 61% to 39%. His party didn't do so well, gaining

just 23 out of the 160 seats in Congress. The majority of congressmen are from the establishment parties and they'll do all they can to protect their interests by blocking Arévalo's initiatives. How can he address poverty when Congress has control of the budget?

The establishment didn't take Arévalo's election well:

- In early September, Guatemala's prosecutor for electoral crimes asked the Supreme Court to strip five magistrates of the Electoral Tribunal of their immunity so they could be investigated on fraud allegations made by Torres and her party.
  - The Attorney General issued arrest warrants for founding members of Semilla.
  - Congress stripped Semilla's elected legislators of their party status, which effectively limits their ability to act as legislators, leaving Arévalo without a party to advance his agenda.
  - The Attorney General ordered raids on Electoral Tribunal offices, illegally opening ballot boxes and counting ballots. The Electoral Tribunal warned that "the chain of custody of the vote has been broken".
  - On October 4<sup>th</sup>, the Supreme Court upheld the decision to raid the Electoral Tribunal.
  - On October 5<sup>th</sup>, the Constitutional Court upheld the move by prosecutors to suspend Semilla because of alleged voter fraud.
- Protests, often led by indigenous peoples and farmers, are surging.
- Some are calling the actions of the old-guard elites a slow-motion coup. And there's still lots of time for more of their troublemaking since Arévalo doesn't assume the presidency until January 14<sup>th</sup>.



**Poverty** - Almost half of Guatemalans live in poverty. That rises to 80% for indigenous peoples who make up over 40% of the country's 14.9 million people. Nearly half of children under five suffer from chronic malnutrition, among the highest rates in the world. For indigenous children, the rate is 58%.

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