

### Questions You May Not Have Thought to Ask About Sloths



1. What's this about sloths and convergent evolution? - Page 8

2. Do sloths fart? - Page 10

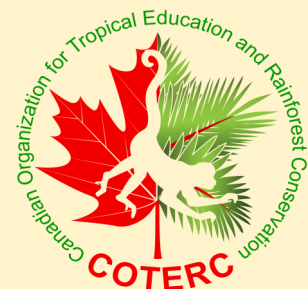
Join us Sunday, December 3  
at 2:00pm EST for

# FIESTA del SOL

A FUNDRAISER TO

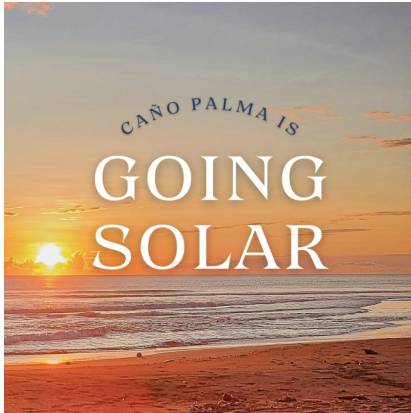
# GO SOLAR

### Thanks To All Who Participated



Canadian Organization for Tropical Education & Rainforest Conservation

# Winter 2024 Issue



Being located in remote rainforest far from an electricity supplier, Caño Palma can be left stranded by damage to power lines. On Page 5, Charlotte outlines the situation when the power goes down, which some of you may have experienced. That's why

we focused our recent fundraising on the installation of solar panels. They'll provide a great degree of reliability.

So, we're pleased to announce that, combined with Giving Tuesday, we raised over \$10,000 towards our goal of installing solar. And of course solar power is clean power.

Our thanks go out to all of you who made our fundraising a success with your generous donations. And we have to thank Amy Cocksedge and Nick Humphreys, members of your COTERC Board who worked overtime to put the events together. As well, a loud shout-out to former Board member Andrew Morris for doing a great job hosting the online show.

DD

## Visit COTERC's new website

If you haven't already, take an online journey to our new and improved website by pressing CTRL and clicking here: <https://www.coterc.org/>

COTERC's refreshed website is meant to be more accessible and better organized. To get to any location, it will take no more than two clicks.

As well, since we're combining two websites into one, it should be a lot simpler to find what you're looking for.

Again, thanks to Amy Cocksedge who, without any previous experience, pulled off the herculean task of putting this new website together. Of course, we should also recognize fellow Board member Jess Sutton who assisted Amy.

If you have any suggestions on how to improve the updated website, please let us know.

**Follow Us By Clicking On**

**Website** - [www.coterc.org](http://www.coterc.org)

**Facebook** - [Station Caño Palma](#)

**Facebook** - [Canadian Organization for Tropical Education and Rainforest Conservation \(COTERC\)](#)

**Instagram** - [canopalmabiostation](#)

**Twitter** - [@coterc](#)



**Become a Monthly Donor**

<http://www.coterc.com/donations.html>

Previous issues of *Raphia* can be found at -

<https://www.coterc.org/the-raphia-newletter>

ISSN 2564-5927 (Online)  
ISSN 1188-2425 (Print)

## My Research Internship Experience at Caño Palma by Dessi Sieburth

In the summer of 2022, I was a research intern at Caño Palma Biological Station. This was my first visit to the Costa Rican rainforest, and it turned out to be one of the best learning experiences I've ever had. Although my main interest was birds, I had the amazing opportunity to learn about other wildlife as well. I participated in research by surveying tropical forest birds, sea turtles, caimans, mammals (including jaguars, peccaries and armadillos), and several species of bats (Jamaican fruit bat, Watson's fruit-eating bat and Honduran white bat). I also took data on behaviors of great green and scarlet macaws as well as Neotropical river otters. Every morning, I'd wake up at 4:30 to go into the rainforest, take a kayak along the rivers, or walk along the beach for these wildlife surveys. I'd spend about 7 hours each day collecting data and several hours a week entering the data.

During the internship, I had amazing experiences with a wide variety of wildlife. The incredibly loud howler monkeys were in the station garden almost every day while we were cooking dinner, along with the very adorable white-faced capuchins and Geoffroy's spider monkeys. I observed several 4-meter-long crocodiles patrolling some of the larger rivers. One ended up going onto the beach where we'd normally do the turtle surveys. Because of the crocodile, the surveys had to be put on hold for a few days (*How many people can say they couldn't go to work because of a crocodile!*).

However, the highlight of my internship was my experience with a green sea turtle. They're fascinating animals, growing up to four feet in length and weighing over 350 pounds. They spend all their lives in the ocean, except for when they come onto beaches to nest in the middle of the night.

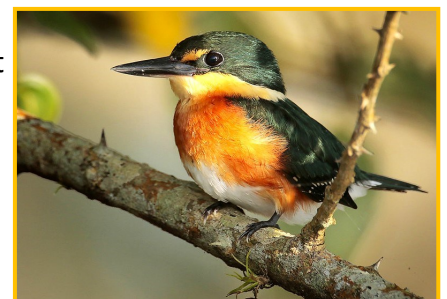
One night while monitoring the beach, I was fortunate enough to observe a turtle emerge from the ocean to nest. She dug a massive hole in the sand, undeterred by our presence, and once she was ready



to lay her eggs, I placed my hand under her tail to count the eggs.

Each egg slid off my hand and into her pit, and when she was done, I had tallied 102 eggs - actually slightly below the average egg count of a green sea turtle. By the time she returned back to sea, the sun was already coming up, which was very unusual (usually they return to sea well before sunrise). This was a once-in-a-lifetime encounter with one of the world's most unique species.

I also enjoyed the incredible birding opportunities around the station. The haunting calls of the great tinamou and laughing falcon woke me every morning. Yellow-throated and keel-billed toucans moved through the garden as we ate lunch. Five kingfisher species would dart along the rivers, including the 5-inch American pygmy kingfisher (at right), one of the world's smallest kingfishers.



(Cont'd on next page)

## My Research Internship Experience (cont'd)

White-collared manakins were one of the more common birds at the station - in fact, the manakins had made the forest next to the station their lek site.



White-collared manakin



White-fronted nunbird

Manakins are quite unusual among birds in that they form leks, meaning many males congregate in a small patch of forest. When a female arrives, the males begin flying around and making very loud noises by snapping their wings together above their back. I heard these snapping sounds almost constantly. In my free time, I'd take a kayak into the

nearby villages to go birding, where I saw a variety of beautiful species such as slaty-tailed trogon, white-fronted nunbird, and king vulture.

Before and after the internship, I had the opportunity to travel around Costa Rica on my own to experience and learn about the country's birdlife (as incredible as the birds were at the station, the Caribbean coast is by far the least diverse area of Costa Rica for birding). Before the internship, I visited the Cordillera Central mountain range, which stretches between eastern Costa Rica and western Panama and has many endemic birds found only within that range. Among the birds that live there is the resplendent quetzal, one of Costa Rica's most iconic and beautiful birds. I wasn't able to see any of the exquisite males with their long tails, but I did enjoy nice looks at a female

feeding a juvenile - short tails, but still beautiful! The hummingbird diversity in this mountain range was incredible as I saw nearly 30 species in under a week.

Among these species was the snowcap, a tiny hummingbird whose snow-white cap contrasts greatly with its dark copper body. After the internship, I visited an area of cloud forest near the town of Guapiles, specifically looking for the bare-necked umbrellabird, a bizarre species with its mohawk-like crest and bare patch of skin around its neck. Guapiles is one of the best places in the world to look for this species, and I felt fortunate to have excellent looks at a male umbrellabird perched on an exposed branch 30 feet away. It's endangered due to the fragmentation of cloud forests.

I was sad when my adventures in Costa Rica came to an end. I had many amazing encounters with magnificent birds and other wildlife, and made lots of friends from across the planet who also have a deep passion for nature and the outdoors. I was inspired by the conservation work of Charlotte Foale and Manuel Arias, who are the hosts at the station and lead the research. It was a fantastic learning experience to be part of their research and conservation team. The wildlife surveys and behavioral studies I did are a contribution to the long-term monitoring data that are indicators of the health of the various habitats that surround the station. I was especially excited to have contributed to the monitoring studies on the local populations of great green and scarlet macaws, both of whose populations have been increasing. The long-term monitoring studies depend on interns and volunteers, and I can highly recommend participating in the research of the station. I would like to thank Charlotte and Manuel for giving me this amazing internship opportunity and making it such a rich learning experience. *I'd also like to thank the Los Angeles Birders for supporting me and funding my travel through their scholarship.*

## Notes from the Station by Charlotte Foale

In light of such amazing support in our recent fundraiser, I have to start by saying thank you! Having a solar option on base will make an incredible difference in quality of life for those who come here to study. Many of our student interns stay for 5 to 9 months, and a good number of them are away from family and friends in a way they've never been before. I'm sure that those of you who've been here can remember how overwhelming the adjustment to tropical life can be – the food, the spiders, the marauding opossums in the kitchen (below), the



heat, the humidity and of course, the unpredictable power. While, over the short term, flashlight dinners can seem like an

adventure, as a student with the pressure of research assignments and deadlines, knowing that you can rely on connectivity to complete your assignments as well as your fieldwork definitely relieves the stress. Knowing that we have power to recharge batteries for our field equipment and to keep our water pump running, makes life a lot easier for staff and students alike. Once installed, we are hoping that solar will help to reduce our overheads so that we can focus our funds on more station improvements and

research projects. At this time of year, we usually take advantage of the more stable schedule that marks the end of the turtle season to repair and prepare for the new season. The beginning of 2024 is no exception, with work recently starting on our library rebuild. Many here in 2021 will remember the flood that breached the library ... despite it being elevated more than a meter above the ground. The new structure will take that into account, and we will be going higher as well as moving away from the forest edge to reduce the potential of damage to the roof and humidity damage to the windows. We've also taken advantage of lower river levels to perform maintenance on the base of the dock.

While all of this goes on, we of course continue with the research surveys. We have a great group of interns here working under the watchful eye of our Research Coordinator, Nathan Delmas. They are doing an amazing job on surveys and on base, all in all great additions to the Caño Palma family! Thank you to the current crew, and to all the interns, volunteers, donors and COTERC Board members who have helped us this year. It was a tough one, but as in many aspects of life, made so much easier by having such a great family to support us!



# Christmas at Caño Palma



# Library Rebuild



Photos by Charlotte Foale

## R.I.P. -- Hilary Lee and Bryan Bridgeman



### Hilary Lee

Hilary, a former Coterc Board member, passed away in September. Hilary devoted a lot of time to Coterc over the many years she was on the Board. She also spent many more years helping organize the Tropical Treat fundraising events.

Hilary was also a long-time volunteer at the Toronto Zoo, contributing her time and knowledge right up until her untimely passing.



### Bryan Bridgeman

Bryan passed away in October. He was Coterc's Director of Site Services from 2002 to 2006, years that were quite difficult for our organization and Caño Palma.

Bryan was also a founding member of the Ontario Herpetological Society. He was a long-time paramedic who was on the board of the Children's Aid Society, and a representative for the Foster Parents Society of Ontario.

## "One of the most striking examples of convergent evolution known among mammals" by Doug Durno

Amazingly, though 2-toed and 3-toed sloths look alike and act very similarly, these two surviving genera are only distantly related. Their last common ancestor walked the Earth some 28 million years ago.

What makes their convergence so unusual?

- Very few animals are **folivores**, including ancestral sloths, that live exclusively on leaves like the six species of sloths alive today do.
- Unlike their long-ago ancestors who were ground-dwelling, present-day sloths evolved to be **tree-dwellers**.
- So far, an extinct sloth that moved **upside-down** through the canopy like the six extant species hasn't been found.
- While a few animals exhibit **suspensory behavior**, those species are mostly just dangling from a limb to eat or hurrying along branches. Modern sloths appear to be the only vertebrate that lives upside-down most of the time (bats do a lot of flying).
- They have **unusual claws** (at right), unique maybe, that are large and curved to move them along while ensuring they don't fall.
- Their **limb muscles** are adapted for strength and stamina to give them a strong grip on branches.
- **Tendons** in their hands lock their claws onto a branch, providing security and saving energy.
- **Muscle mass** makes up only 25% of their total weight whereas most other mammals are in the 40-45% range.
- Perhaps their most distinctive trait that differentiates them is their **low-energy lifestyle** - they have the lowest metabolic rates of any mammal.
- Modern sloths are highly unusual in the **amount of food** they carry in their stomachs - it's about one-third of their total weight. Yet they eat very little compared to other mammals. But a leafy meal can take up to a month to pass through their digestive system in order to draw as much nutrition as possible from said leaves.
- Both genera have **algae** living in grooves of their fur, fur that provides the damp environment that algae require. And sloths aren't big groomers so that the algae can settle and enjoy sustenance from organic material that's unlikely to be removed.

We could list many more adaptations that *Choloepus* and *Bradypus* have converged upon, notably some of the energy-saving modifications for their slow lifestyle that were covered in (cont'd on next page)





## Convergent Evolution (cont'd)

the last issue of *Raphia* (Fall 2023). But what are the differences that demonstrate that 2-toed and 3-toed sloths have evolved along separate paths?

**Fingers** - The most obvious answer is the differing number of digits on their front feet.

**Cervical vertebrae** - While sloths are the only mammals (along with manatees) to not have 7 cervical vertebrae - the 2-toed has fewer (5-6) while the 3-toed has more (8-9).

**Ribs** - Two-toed sloths have 46 ribs, the largest number of any mammal, while the 3-toed has 28. Why do sloths have more ribs than humans who have 24? First, it gives more support to their stomachs that are carrying up to a third of their weight. Second, being flexible, extra ribs give them more protection when they fall, which they do.

**Tail** - Only the 3-toed has a tail. As seen at right, it's short - 6-7 cm long (2 to 3").

**Diet** - While the 3-toed feeds exclusively on leaves, the 2-toed mixes in fruit, flowers and bark.

**Metabolic rate** - The 3-toed's is lower than any other mammal.

**Body temperature** - The 3-toed's is more variable than the 2-toed.

**Activity** - Compared to the 2-toed, the 3-toed doesn't move around as much and is generally slower moving.

**Sleep** - The 2-toed sloth mostly sleeps hanging upside-down while the 3-toed usually sleeps and rests by sitting in the joints of branches.



### References

**Sloths: how did two different animals wind up looking so similar? | Research and Innovation (europa.eu)**

**<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6183012/>**

**Sloths guide: why they are covered in algae, why they are so slow, and why they always seem to be smiling - Discover Wildlife**

**SlothOpedia | Everything you ever wanted to know about sloths! | SloCo (slothconservation.org)**

**What is a sloth? - Slothville**

## Digestive Adaptations of Sloths by Doug Durno

Sloths obtain little nutrition from their diet of tree leaves. As discussed in the last Raphia (Fall 2023), this diet has led to energy-saving adaptations such as their slow metabolic rate, sluggish movements, and variable body temperature. But their digestive system has also had to adapt to their low-energy/low-nutrition way of life.

**Diet** - Though the Earth is blessed with an abundance of leaves, few mammals are dedicated leaf-eaters (folivores). That's because not only are leaves lacking in nutrition and energy, but they also contain hard-to-digest cellulose and toxic compounds. Yet sloths manage to exist on a diet of leaves - the three-toed almost entirely while the two-toed will occasionally consume fruits and seed pods. So, let's take a look at the digestion process as it has worked out for sloths, the animals with the lowest energy requirements of any mammal.

**Digestion** - David Attenborough described sloths as "mobile compost heaps". That's because, remarkably, about one-third of a sloth's weight is food in the process of being digested. A meal can take up to a month to pass through its stomach so that the sloth can extract as much nutrition as possible from the leaves it eats.

While two-toed sloths burn up to 300 calories a day, the number for three-toeds is as little as 130. Researchers monitoring three-toeds found they consumed an average of 73 grams of foliage per day, which equates to 3 leaves. They can get by on so little because they have the slowest metabolism of any mammal. They don't move around much, finding a suitable tree and hanging out for a while (though two-toeds do move around more than three-toeds and have bigger home ranges).

**4-chambered stomach** - How do sloths manage the digestive challenge of cellulose? Like other ruminants, sloths have a 4-chambered stomach. Acids, enzymes and fermentation by symbiotic bacteria break down the leaves (cellulose) to extract any nutrition. Since the stomach has to hold a lot of food during the lengthy digestion process, it's very large.

**Counteracting gravity** - When a sloth is upside-down, gravity could pull the food backwards in the esophagus, causing problems. To prevent that, sloths evolved a rollercoaster-like loop in the esophagus. Food stays in the stomach.

As well, when upside-down, blood could pool towards the head. But sloths have specialized valves to prevent this.

**Do sloths fart?** - The microbes that enable the digestion of leaves produce a lot of methane as a byproduct. In other herbivores, this gas is usually emitted as burps and/or flatulence. However, in sloths with their slow digestive process and large food-filled stomach, the gas would build up over time, causing medical issues and plenty of pressure. Sloths adapted. Instead of farting, the methane can be absorbed into the bloodstream, carried to the lungs, and breathed out of their mouths. One reason not to kiss a sloth.

### References

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4389270/>

[Microsoft Word - 2021 Sloth Nutrition.docx \(nagonline.net\)](#)

## Where Are They Now

### Manuel Santiago -- Preserving the Neotropical River Otter

by Kelsey Evans - University of Idaho

*Manuel first worked with Neotropical river otters while earning his bachelor's in ecology from Universidad Juárez Autónoma de Tabasco in Villahermosa, México. He continued his research at Caño Palma Biological Station while earning his Master of Science in management and conservation of tropical forest and biodiversity from Centro Agronómico Tropical de Investigación y Enseñanza (CATIE) in Turrialba. This is an abridged version of the original article.*

Manuel Santiago, who is presently pursuing his PhD at the University of Idaho, is no stranger to the elusive Neotropical river otter, which ranges from northern Mexico to southern Argentina.

Manuel is working to conserve the species by employing two novel sampling methods to study otter genetics. He's focusing on understanding their move-

said. "As the Central American coordinator and Costa Rican representative for Neotropical otters at the IUCN, I build collaborative networks between Central American researchers working with otters to expand knowledge of and preserve this species in the region, linking the information generated from previous studies of this species in Mexico and South America."

#### Expanding Genetic Health for Conservation

Santiago is developing genetic methods that are relevant for not just the Neotropical otter but other species as well.

"He's developing and testing sampling, collection and storage methods for otter feces," U of Idaho professor Lisette Waits said. "I've sampled several species before, but otters are especially difficult, with genetic individual identification success rates of only 10 to 20%."



**Manuel collecting feces samples**

Meanwhile, the success rate for many other species such as canids, felids and bears is around 50 to 70%. Conservation groups must have more knowledge and access to appropriate genetic sampling methods for otters in order to increase success rates and expand genetic analysis throughout the species' range.

ment between rivers, and how human activities impact their dispersal patterns. Santiago collects genetic samples from their feces to evaluate population size, density, home range, genetic diversity and gene flow.

#### Worldwide Connections

"So far, there are very few people in the Central American region working with the species," Santiago

In tropical countries, otter feces are exposed to heavy rains, warm temperatures and high humidity, which can increase DNA degradation. Santiago is employing and comparing two novel collection and storage methods that include DET buffers and swabbing protocol to discover how best to preserve DNA in tropical environments.

"Due to their elusive behavior, Neotropical otters are very difficult to observe and (cont'd on next page)

## Manuel Santiago -- Preserving the Neotropical River Otter (cont'd)

monitor in the wild. Sometimes the only signs of their presence are their feces, which are usually collected to analyze diet," Santiago said. "By swabbing the outside of the feces for DNA instead, we can collect cells directly from the otters to know more about their secretive life - not just information of what they ate."

### Inspiring the Next Generation

Santiago plans to keep developing educational programs for the Tirimbina school and many other

schools in the future, and he dreams of returning to Mexico as a professor to train the next generation of professionals in natural resources. Manuel hopes to encourage his future students to pursue education outside of Mexico as he did.

Students must take advantage of as many opportunities as possible," Santiago said. "They'll not only learn about new cultures and customs, but also find new ways to preserve nature locally and worldwide."



Except for above pic, photos by Lisette Waits and Manuel Santia-



Manuel (L) & Lisette Waits (center) collecting samples

## Station Happenings by Nathan Delmas, Research Coordinator

**October** **Tent-making bats** - A team from National Geographic led by regular station visitor Dr Bernal Herrera of the Universidad de Costa Rica and Dr Rodrigo Medellín traveled to the station to look at our tent-making-bat project. As well as photographing the numerous types of tents found in our vicinity, they also did some filming. It's possible the team will be back for additional work as they found the station an ideal locale for the quantity, quality and diversity of tent-making bats.

**Dr Medellín** is a Mexican ecologist known for his conservation work with bats, jaguars, bighorn sheep and other species. His work has resulted in the recovery of endangered species such as the lesser long-nosed bat



(*Leptonycteris yerbabuena*), aka the tequila bat; the creation of protected natural areas; the valuation of ecosystem services by bats; spearheading programs to protect wintering grounds for monarch butterflies; securing habitat corridors for jaguars; and the creation of conservation programs in cooperation with industry. For example, Dr Medellín's bat-friendly mezcal and tequila program is quickly becoming an industry standard. In 2014, BBC Natural World produced the award-winning film "The Bat Man of Mexico" about Dr Medellín's work with bats. In 2018, the National Geographic Society produced a documentary titled "Giant Carnivorous Bats

with Rodrigo Medellín", showcasing his work on these endangered, misunderstood bats. In 2019, the National Geographic Society named Dr Medellín its seventh explorer-at-large.

**Bird migration** - It's that time of year for migratory birds. Species heading south that passed by Caño Palma in large numbers this month included eastern kingbirds, bay-breasted warblers and Mississippi kites.

**December** **Great green macaws** - In September, there were no sightings of great greens as they had migrated to Nicaragua. Nathan said they should be back in November. Well, that was quite a prediction. They're back. A total of 742 great greens were observed this month. It should be noted that 86 scarlet macaws were also seen, mostly around the station.

**Central American red brocket deer** - Right under our noses may be an animal ripe for study by some young researcher at Caño Palma. The red brocket deer (*Mazama temama*) is an animal about which not a heckuva lot is known. It doesn't even get a conservation status from the IUCN, which lists it as "data deficient". Yet it shows up in our mammal surveys in respectable numbers. This month, there were 24 observations, half of which were around the station.

*M. temama* is more properly referred to the Central American red brocket deer to differentiate it from *M. americana*, which is simply called the red brocket deer. The former is found from southern Mexico down to the northwest corner of Colombia while *M. americana* ranges across much of northern and central South America.

Males of the Central American red brocket have small, spiked, rear-facing antlers, perfect for getting (cont'd on next page)



## Station Happenings (cont'd)

through the dense forests and bush found in our area without the antlers getting tangled up in the bush. With their preference for well-treed forests, one researcher said that "their presence is indicative of well-preserved ecosystems". Deforestation as well as hunting are their greatest threats.

In our area, it's claimed that they're specialist frugivores. Maybe that's an area for study. Right now much of the research seems to be just centered on sorting through their evolutionary history and relationships (phylogenetics).

## Final Turtle Report of 2023 by Marika Breton, Turtle Project Coordinator

### October

This month, nesting activity for green turtles was down almost 50% from the same month in 2022. This is most likely due to the early start in the nesting season we observed this season, with most nests having been laid in July and August.

| Nesting activity - October                         | 2022 | 2023 |
|--|------|------|
| <b>Leatherback</b> ( <i>Dermochelys coriacea</i> ) | 0    | 0    |
| <b>Green</b> ( <i>Chelonia mydas</i> )             | 50   | 26   |
| <b>Hawksbill</b> ( <i>Eretmochelys imbricata</i> ) | 2    | 1    |
| <b>Loggerhead</b> ( <i>Caretta caretta</i> )       | 0    | 0    |
| <b>Total</b>                                       | 52   | 27   |

### Summary of nest success from excavations in October

Total nests excavated = 142

Mean hatching success = 80.3%

Mean emergence success = 79.9%

Partial dog predation (during the incubation period) = 13

With the end of October officially marking the end of the 2023 turtle nesting season, November will be focusing more on mesh putting and excavations.

### November

With the end of the nesting season, no turtle tracks were recorded on Playa Norte this month. Most of the excavations were completed, with only a few nests remaining to hatch or expire.

Total nests excavated = 115

Mean hatching success = 74.6%

Mean emergence success = 73.3%

Partial dog predation (during the incubation period) = 18

## Challenge of Environmental Crimes in Costa Rica by Doug Durno

*Costa Rica is a leader in protecting the environment compared to other Latin American countries. Yet threats persist. Below, Luis Diego Hernández Araya, coordinator of the Deputy Prosecutor's Office for the Environment (Fiscalía Adjunta Ambiental), discusses the main issues.*

**Coastal areas** - Costa Rica has many marine reserves. But that doesn't mean much if they're not looked after. Hernández says:

- The waters are polluted.
- Coral reefs are dying.
- Illegal fishing is depleting Costa Rica's seas. **Hammerhead sharks**, declared by Costa Rica's Constitutional Court to be endangered and "one step away from extinction", have had a fishing ban placed on them. **Yellowfin tuna** were being decimated by nearshore commercial fishing so a 40-mile buffer zone was introduced. Hernández says this needs to be widened to protect not only the yellowfin, but also the dolphins with which they swim.

**Freshwater** - It's estimated that between 1997 and 2015, 3,000 people were hospitalized because of poisoning by agrochemicals - that is, fungicides and pesticides contaminating drinking water.

**Species trafficking** - Traffickers are attracted to Costa Rica because of its reputation as a biodiversity hotspot. And smuggling isn't confined to animals. Cocobolo wood (*Dalbergia retusa*), highly valued for its density and beauty, is listed as Critically Endangered by the IUCN.

**Forests** - Costa Rica is lauded for the amount of forest cover that's been restored over the past 30 years. Yet Hernández claims that deforestation is ongoing even in protected areas. When forests are depleted so is biodiversity because of fragmentation, desertification and loss of biological corridors.

- Hernández called the main issue "land trafficking", which is the taking of land by fraudulent means and then reselling or renting it for pineapple or banana plantations, or for real estate.
- Pineapples are being grown in important wetlands.
- Cultivation of marijuana in protected wilderness areas, including national parks and wildlife refuges, is an issue. Between 2007 and 2018, those areas accounted for 25% of the marijuana grown in Costa Rica.
- SINAC says that illegal logging is the number one complaint reported to them. This hits pretty close to home as our canton Pococí is listed as one of the areas with the highest incidence.
- A Guanacaste conservation group claims that nearly half of forest fires in the first half of 2023 were caused by hunters who set fire to an area so that, when new growth appears, it attracts deer and other animals.

Though Costa Rica has many laws to protect the environment, Hernández wants to close loopholes and make penalties more severe. Since organized crime is behind most environmental crimes in Costa Rica, he wants laws that declare certain offences to be labeled "organized crime" to make investigation easier. As well, corruption among state officials responsible for managing natural resources is a problem that needs addressing.

**Note** - In December, Costa Rica unveiled a satellite monitoring center aimed at strengthening conservation and surveillance within the country's marine protected areas. This comes at a critical moment as climate change, overfishing and tourism increasingly threaten delicate underwater ecosystems. Cutting-edge technology now enables real-time vessel tracking to ensure compliance in no-take zones and regulated fishing grounds across nearly 5.3 million hectares of ocean.

# COTERC

## Canadian Organization for Tropical Education & Rainforest Conservation

### ADVISORY COMMITTEE

Tom Mason  
Dr Kevin Kerr  
Dr Wm. Rapley

Founder  
Marilyn Cole

### BOARD OF DIRECTORS

Chair • Dr Kymberley Snarr  
Vice Chair • Nick Humphreys  
Finance • Greg McLean  
Mitchell Viveiros (co-director)  
Marketing • Vacant  
Data Integrity • Dr Roberta Fulthorpe  
Research & Conservation • Dr Emily Khazan  
Development • Amy Cocksedge  
Special Events • Vacant  
Grants • Jess Sutton  
Strategy • Dr Tom Bregman  
Director at Large • Dr Nathan Lovejoy  
Director at Large • Sarah Ravoth  
Raphia • Doug Durno

To ensure you feel involved, we welcome any comments or suggestions. If you have an idea for an article, or better yet, would like to write one yourself - if you have a photo or two you think we could use - if you have a suggestion for improving Raphia, please send it along to us at [raphia@coterc.org](mailto:raphia@coterc.org)

Contact COTERC at:

[info@coterc.org](mailto:info@coterc.org) OR

Box 335  
Pickering, Ontario  
Canada L1V 2R6

To unsubscribe from our distribution list, please send your request to: [raphia@coterc.org](mailto:raphia@coterc.org)

COTERC is a registered Canadian non-profit charitable organization

#890096183 RR0001 (est. 1991)