

We Won't Have a Society If We Destroy the Environment

- Margaret Mead

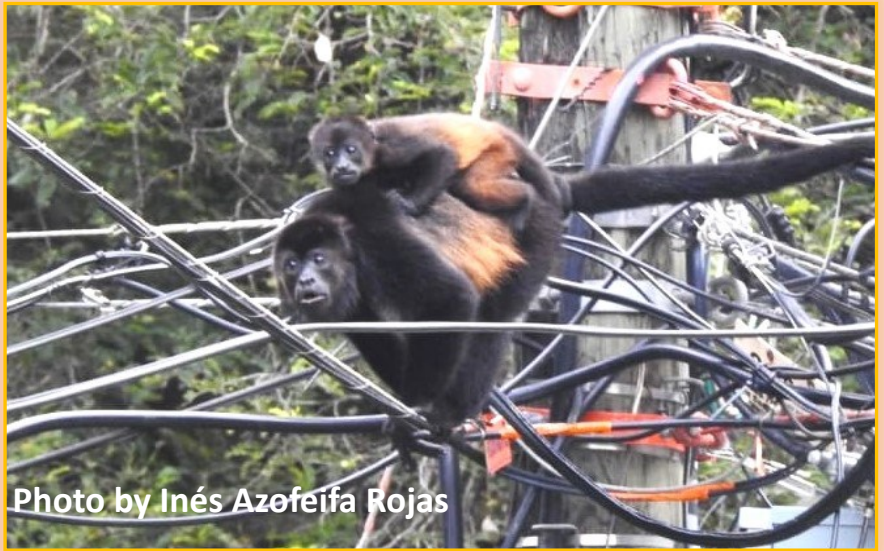


Photo by Inés Azofeifa Rojas

Monkeys Being Electrocuted Page 9

Beaches Being Plasticized Page 3



Coasts Being Eroded Page 12



Canadian Organization for Tropical Education & Rainforest Conservation

COTERC's Annual General Meeting Thursday June 8th - 7 pm (EDT) (via Zoom)

If you wish to attend, please contact Dr Snarr at chair@coterc.org no later than May 25th, 2023 to obtain registration details.

Board Election

Election of the Board of Directors positions listed below will occur at this meeting. Terms are 2 years unless otherwise indicated. If interested, please submit your CV to Dr Snarr at chair@coterc.org no later than May 25th, 2023 indicating the position you are interested in.

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- Director of Station Advancement
- Director of Web Services
- Director at Large 1
- Director at Large 2
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- Special Events Coordinator (1 year)

Call for help: We're in the process of revamping our websites and we're looking for someone with the skill set in web design to help us through the more difficult aspects of this project. The time commitment is flexible and dependent on the volunteer's schedule. If you or someone you know can help, please contact us at: Raphia@coterc.org. Thank you!
—The COTERC Board of Directors.

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Why Caño Palma Is Important

As the cover shows, three articles in this issue revolve around a similar theme: environmental transgressions by we humans that negatively impact Costa Rica:

- Marine debris - Page 3
- Electrocution of monkeys - Page 9
- Coastal erosion - Page 12

On our own, we might feel helpless to address such problems. Together, as interns or volunteers or Board members, we've all contributed. We've done research like that outlined in Melina's summary on marine debris. We've monitored such things as erosion as well as plants and animals. We've deterred poachers. We've advocated for the safeguarding of area land so that it remains in its natural state. We've provided environmental guidance for the local community.

We can't do this on our own. So we thank you for your continued support so that we can carry on this crucial work that you started.

Since the pandemic, we've experienced financial pressures. Without interns and volunteers arriving, our finances have been severely impacted. While we've been fortunate enough to make it through, thanks in large part to support from our donors, our finances still remain uncertain.

To help us continue our work, we're trying to increase our monthly donors. Monthly donations can be any amount, from \$1 to \$100. They are withdrawn automatically every month and can be adjusted at any time. All donations are tax-deductible in Canada and the US. If you are interested in becoming a monthly donor, click here: <http://www.coterc.com/donations.html>

Previous issues of *Raphia* can be found at -
<http://www.coterc.com/raphia-newsletters.html>

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Seasonal Deposition of Marine Debris on Playa Norte by Melina Damian

Melina is an environmental scientist and educator. She currently works at Ontario Nature, a non-profit based in Toronto, as a communications coordinator. She also teaches a course at Centennial College on Energy, Environment and Sustainable Development. She has a Masters in Environmental Studies from York University and a graduate diploma in environmental education. She has authored two scientific studies on the impacts of plastic pollution on wildlife.

Anna Harris & Josephine Aussage are co-authors of this paper.

Anyone who has walked our beach, Playa Norte, will have noticed the incredible amount of debris. It's impossible to miss. Unfortunately, too often that applies to the sea turtles that make Playa Norte their nesting grounds. Marine debris and marine turtles don't mix well.

Approximately 80% or more of the anthropogenic debris that accumulates in the natural environment is plastic. All species of marine turtles are affected by entanglement or ingestion of marine debris. When it drifts onto nesting beaches, it not only puts nesting females at risk of entanglement, but may impede hatchlings from exiting the nest, and makes them more vulnerable to predators.

This only exacerbates the situation for the 4 species of sea turtles that nest on Playa Norte since they're already evaluated by the IUCN as at risk at some level:

- Greens - Endangered
- Leatherbacks - Vulnerable
- Loggerheads - Vulnerable
- Hawksbills - Critically Endangered

In our study, we conducted accumulation-rate surveys following a standardized marine-debris protocol. On a monthly basis from March 2016 to January 2018 along a 100-meter stretch of Playa Norte, volunteers and staff from Caño Palma collected, counted, and classified the different types of marine debris. In total, 191,030 debris items were tallied. Plastics accounted for about

96% of the items collected.

It's been found that rivers are a major entry point of marine litter into the oceans - about 80% according to some research. So, it's possible that land-based litter accumulating on Playa

Norte was largely a result of the Tortuguero River transporting debris from adjacent communities, some of which have resorted to illegal dumping of debris in the natural environment given their lack of proper waste-disposal facilities.

Other research suggests that plastic coming from Central American rivers usually peaks between June and October, which corresponds with the season with highest debris accumulation in our findings for Playa Norte. We suggest that this relatively drier period lacks the greater amount of rainfall and/or flooding events that would pull debris off of the beach and back into the ocean, such as probably (cont'd on next page)



This photo illustrates how plastics are scattered amidst the natural debris. Plastic bottles appear to predominate.



Seasonal Deposition of Marine Debris on Playa Norte (cont'd)

occurs in our heaviest rainfall period from November to January.

Putting this all together, it's crucial that villages near the Tortuguero River have access to safe and effective waste disposal.

On a world-wide basis, in 2010 alone, Jambeck et al. (2015) estimated that 99.5 million metric tons of plastic waste were produced in coastal regions, highlighting the importance of mitigating land-based litter inputs. On Playa Norte, understanding the factors influencing marine-debris deposition is critical for protecting the habitats of at-risk nesting marine turtles, and can inform managers and the local community on possible strategies that could be used to prevent and reduce marine pollution.

The original paper can be found at: [2022Damien - Marine debris.pdf](#)



How bad a problem is marine debris?

As Charlotte noted about the 2016-18 survey: "On our very first outing, for every meter we cleaned, there were 500 pieces of trash. Our turtle transect is 5029 meters. So if we cleaned the entire transect, we could expect to remove approximately 25,146,000 pieces of trash. Day one."

Multiply our small transect by the entire Caribbean coast and the number of pieces of trash contaminating all Caribbean shoreline is unimaginable.



It didn't take long to fill all these bags with plastics for recycling.

Photos
courtesy of
Charlotte
Foale

Notes from the Station by Charlotte Foale

2023 is flying by and, while there are too many positive things going on to report them all, seeing new life in our community program puts a smile on my face every day.

Having struggled to fill our community internships post-Covid, we currently have two marvelous interns - Antonia and Mariola. With their amazing efforts, Environmental Education is in full swing at the elementary school. With all grades being taught, our interns not only plant the seeds of environmental appreciation, but also help the teachers to move towards achieving the environmental award "Bandera Azul". While participation in this award is compulsory, the school has to meet many sustainability goals to achieve it. They have to look at the waste generated as well as ways to reduce it and promote a more sustainable way of life to the students. Students at all grade levels need to receive environmental education and participate in school improvements, and we're happy to be able to help the teachers along.

Another important aspect of our community program has been educational support, primarily in promoting literacy, numeracy and science through different activities. As local high-school students have not been receiving in-class lessons since 2019 because of infrastructure issues, Conservation Club has shifted focus to fill these students' unstructured time with a little extra science. Because they desperately need to be at school with their teachers, we're also helping with fundraising events to facilitate classroom repairs until reconstruction can take place.

To work towards promotion of literacy, this year we've shifted our mini-library to the gates of the

school to ensure that all of the students have access to these resources. We lend books every Friday and this project was boosted immensely by the donation of around 70 new Spanish language story books by Mariola's mum. As a school teacher in Spain, she had access to books that the school no longer needed as they went digital, and she delivered them to our door - a truly dedicated teacher! While we have several hundred books in English, this donation DOUBLED the number of Spanish books we have. With great support from the teachers, the books are being devoured - with us lending 49 last week alone. Books at home are rare and can't be found for sale in the neighbouring towns - we comb second-hand book stores in San Jose when we get the chance so it's really energizing to see the enthusiasm students have for reading. Some of them are borrowing books as they come into school, reading them in recess and changing for a new book as they leave.

Mariola and Antonia aren't the only ones helping at the school, with all staff and interns rotating through in recent weeks to help fulfill a promise from last year's recycling program. We sold all of the plastics and cans the students brought in, and while plastic has virtually no resale value (9c per kg), each grade won a percentage of the

money made from the cans sold (90c per kg). First grade were the overall winners and with \$150 to spend they voted to buy games and puzzles for recess, and redecorate (cont'd on next page)



Notes from the Station (cont'd)

their classroom. With supplies purchased, we took advantage of the Easter break to repaint the classroom, fill their shelves with games and puzzles, and ensure that students returned to find the rewards of their hard work. This year we will run the program a little differently, letting the student government make the decisions on how they

want to spend the money they make from can recycling, and we're hoping that will drive them to promote participation across the grades.

None of this work would be possible without an amazing team of interns and we're really grateful to them all for their incredible work!

Mariola & Antonia engaging with their students



Photos by Charlotte Foale

Notes from the Chair by Dr Kym Snarr

As I sit at my desk writing, snow is dropping from the Ontario sky. This after a week of soaring 25°+ C temperatures. Certainly, there is clear evidence of major fluctuations in the weather patterns, which all add up to climate change! I was at the station in February this year to bring in donated equipment, carry out the yearly evaluation of the station site, and work on the forestry-plot research with my now-retired husband, Art Shannon. Seeing a beautiful new building built mainly with the generous donation by the Griggs Family Foundation brought joy! It is located close to the dock and has space for large group presentations, sleeping quarters for long-term staff, and storage under the building, which has been built higher off the ground than the other buildings. We continue to need to raise the level of all buildings off the ground due to increased flooding in this lowland palm-dominated Caribbean wet forest. This and the dynamic beaches are indicators of climate changes.

What kind of impacts do these incredible fluctuations and changes have on the flora and fauna in an important area of biodiversity like we have at Caño Palma Biological Station? To dig into understanding this, we need long-term data. And that's one of COTERC's most important goals - 'to facilitate research related to ecosystem conservation and restoration'.

So, how much data do we have? A lot: over 17 years for marine turtles, 20+ years for climate, 12+ years for mammals, 9+ years for snake ecology and morphology, 11+ years for caimans, 10+ years for plant phenology, and 6+ years of forest-plot monitoring. Beyond this, we have data for specialized species: 6+ years for great green macaws, 8+ years for tent-

making bats (middle right), and 6+ years for neotropical river otters (bottom right). As well, there are two currently retired projects that provide 8 years of boat-survey data and 5 years of shorebird-monitoring data. This is a rich cache of data! We have reported results to MINAET who have taken the basic findings from this work to help implement ecosystem conservation and restoration. In a recent meeting, they reflected on the importance of this information as it allows them to carry out their own work in a well-informed manner.

With all these years of data, I am extremely hopeful that there are current professors who wish to work in partnership with COTERC at Caño Palma to bring their students and have access to these databases for learning experiences as well as for publication. This way, a solid analysis can bring understanding to trends and fluctuations in the flora and

fauna, enabling evaluations with several variables as to why they may be occurring. Feel free to reach out to myself, chair@coterc.org or Dr. Emily Khazan, researchconservation@coterc.org, to discuss the potential of this. This will help us achieve the goal we set out in our mission statement: "To provide immersive learning experiences that deepen comprehension and appreciation of tropical ecosystems."



Howler Monkeys -- Part 2 by Doug Durno

Howlers adapt to forest fragmentation better than other primate species due to their low-energy lifestyle and ability to exploit many food sources.

Unlike almost all other New World primates, both sexes of howler monkeys are pushed out of the troop on reaching maturity. Individuals wander off into the forest till they find a troop that will accept them.

All the while they're getting by with their low-energy diet of leaves and whatever higher-energy fruit they can find.

Things aren't made any easier by we humans who eagerly cut down the trees the howlers depend on for nourishment. And howlers, being creatures of the canopy, find it more difficult to make their way through the forest since we obliterate the trees that provide the connecting branches that form their walkway. This ongoing fragmentation of the howlers' habitats limits them to smaller patches of forest.

And yet howlers are pretty successful. It's believed that the 15 howler species are preadapted to cope with habitat fragmentation, demonstrated by the fact that they have the widest distribution of any of the New World primates, ranging all the way from Mexico to southern



Range of all howler species

Brazil. They're able to adapt to a wide variety of habitats as well as small and disturbed forest patches. That's due to a flexible diet so that it almost doesn't matter what a fragment offers as long as the

available plants provide leaves or fruit. Since they don't have to travel very far to find leaves, a troop of howlers typically doesn't require a large territory - black howlers need only about 31 hectares. Contrari-

ly, spider monkeys with their primarily fruit-based diet require a home range of 300 hectares. So, howlers adapt to forest fragmentation better than other



Black howler (*Alouatta caraya*) - Also called black-and-gold howler

Dwell in southern Brazil, Paraguay, northeastern Argentina and eastern Bolivia

Females (gold) outnumber males in a troop

Near threatened

primate species due to their low-energy lifestyle and ability to exploit many food sources.

Their ability to get by in smaller spaces doesn't mean that everything is just fine for howlers. Living in small forest fragments increases their vulnerability to hunting and disease. Plus troops in isolated fragments are more vulnerable to inbreeding.

Color Vision

Neotropical primates are color blind. That is, their eyes have only 2 types of cone cells (photoreceptors). In fact, most mammals have this dichromatic color vision - meaning they're red-green color blind.

Howler monkeys (and humans) (cont'd on next page)

Howler Monkeys

(cont'd)

are exceptions. They're trichromatic, able to differentiate reds and greens. Researchers theorize that this ability to discriminate red from green at a distance in a forest would be a big advantage since howlers prefer young, nutrient-rich leaves that are often reddish. As one researcher put it: "New leaves are nutrient-rich but a relatively rare and fleeting resource, and there is likely strong selective pressure to capitalize on them when they're available" (Welker, 2004). Not only that, but young leaves generally contain fewer toxins than more mature leaves. And they have less cellulose, making them easier to digest.

On the other hand, those New World primates that make insects a good part of their diet might be

advantaged by dichromatic vision. Insects often use camouflage to avoid getting eaten. Part of their camouflage arsenal often involves their coloration, which can hamper the ability of trichromatic predators to see patterns, borders and textures. Color-blindness might give dichromatic primates an advantage in detecting those insects.

Look for more howler adaptations in *Raphia's* Summer issue.

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<https://onlinelibrary.wiley.com/doi/10.1002/ece3.2716>

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As the Rich Swarm Costa Rica, Thousands of Monkeys Are Being Electrocuted

by Noah Kirsch

This lightly edited article originally appeared in The Daily Beast on March 24th, 2023. Original found at: <https://finance.yahoo.com/news/rich-swarm-costa-rica-thousands-234528860.html>

Note that, though the article focuses on howlers, this problem affects all 4 of Costa Rica's monkey species. Plus the problem isn't confined to Costa Rica.

The town of Nosara occupies a dazzling portion of Costa Rica's Pacific coast. Just north, thousands of baby sea turtles stagger their way to the ocean. The jungle teems with hummingbirds and coatis, peccaries and blue morphos and iguanas. Up in the branches, howler monkeys unleash their loud roars.

Once a quaint hideaway for yogis and surfers, Nosara has steadily beckoned more visitors, each cohort seemingly richer than the last. Rental prices in sought-after areas have nearly doubled, locals say, while mega-mansions are selling for \$7 million or more.



Nosara on the Nicoya Peninsula

One casualty of that explosion is the wildlife that inspired much of the region's popularity to begin with. Howler monkeys are suffering particularly gruesome deaths: from dog attacks, car accidents, and electrocutions caused by uninsulated power lines.

Because of dwindling habitat, "they're forced to travel either on the ground, where they're vulnerable, or on power lines, where they get killed," said Robin Heubel, a retired wildlife biologist who lives in the area. The electrocutions could largely be prevented by spending a few hundred dollars to insulate each transformer, but nobody has put up enough money yet.

Depending on who you ask, multiple parties are to blame: the power companies, the government, the developers, the home buyers. Undoubtedly though,

the surge of foreign transplants is exacerbating the problem. "With every new building, there's higher voltage needed, because people are now building two and

(cont'd on next page)

Howlers Are Being Electrocuted (cont'd)

three-storey homes," said Vicki Coan, founder of the nearby Sibú Wildlife Sanctuary. "[And] they want them totally air conditioned."

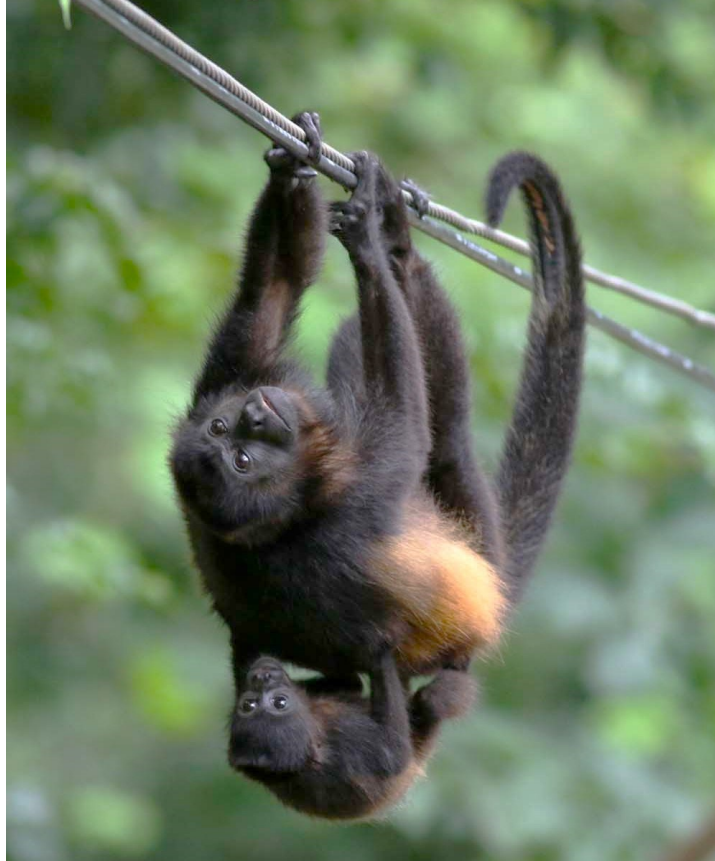
The result, she added, is that "this has been the worst year ever for electrocutions."

The issue extends beyond Nosara. In Tamarindo, two hours north, tangles of wires line the streets, a testament to the town's growing popularity but a perilous new reality for the monkeys.

It's difficult to estimate the exact number killed each year. Francisco Sánchez Murillo, veterinary director for International Animal Rescue Costa Rica, said that a monkey is reported dead from electrocution roughly every three days along a portion of the Guanacaste coast. However, many deaths go unreported, meaning that across the country the tally is likely many multiples higher. One 2020 report claimed that 7,154 animals were electrocuted "in a single year."

Recently, Coan said, she got a call about an electrocuted monkey. "Somebody's saying, 'Yeah, his hand's on fire and it melted and then [he] dropped.' Unless it's super-high voltage, that death is not instant." In the 1990s, Nosara was idyllic. Says Coan: "It was a diamond in the rough back then. It was just an amazing place. You had this pristine seven-kilometer beach and gentle waves, and a jungle, and then maybe a small little B&B."

By the mid-2000s, the town had become a destina-



tion. The *New York Times* named Nosara one of 45 places to visit in 2012, and from there, tourism increased dramatically, multiple residents said. The pace hasn't slowed.

The attention brought much-needed tourism dollars, but also major drawbacks. Rent prices have risen for both locals and expats.

Meanwhile, homebuilders and property investors are cutting down trees, sometimes flouting permit requirements. "It's like everybody's on this bandwagon to make as much money as they can as fast as they can, with no regard to the environment," Coan said.

When the trees disappear, the monkeys become more vulnerable. Howlers consume enormous quantities of leaves, requiring them to stay on the move. According to Heubel, they learn routes to food sources from older generations. When the routes

disappear, they often take to the power lines.

Nathaniel Jackson, a realtor in Nosara, offered a softer take on residents, arguing that newcomers and builders generally seek to protect the environment.

"This is a biodiverse area, so competition between people and the planet is always going to be an issue," he said. But he noted residents had previously donated funds to insulate power lines - after the gov't and electric companies did not - and even formed an activist group to prevent electrocutions. He added that most expats view environmental protection as the top of their "priority list in regard (cont'd on next page)

Howlers Are Being Electrocuted

(cont'd)

to why they moved here in the first place".

Costa Rica's Ministry of Environment and Energy sent *The Daily Beast* information about ongoing efforts to address the electrocutions, including establishing a working group between civil society, the ministry and power-distribution companies.

Despite those efforts, the problem clearly persists. If a monkey gets electrocuted, the troop will wait a week, then may try to cross at the same point, said Inés Azofeifa Rojas, field director of the nonprofit wildlife protection group SalveMonos. "They know it's a risk," she said. But they need to eat.

According to Sánchez Murillo, about 85 percent of electrocuted monkeys die on the spot. Of the small fraction that make it to a rescue center, another third will succumb to their wounds.

Sánchez Murillo has witnessed the horrifying electrocutions in person. In some cases, "the monkey starts screaming in pain," he said.

"And the problem is that sometimes the troop, their family, tries to go and help," which only results in more casualties.

The death count may also rise if a troop's alpha male is killed, Sánchez Murillo said. A new leader will join the group and will likely kill the infants of the fallen male in order to establish its own genetic line. Consequently, "just one animal getting electrocuted could develop into a lot more getting killed," he said.

There are a few proposals for keeping the monkeys safe. Azofeifa Rojas endorses placing power cables underground - costly but highly effective. Where that isn't possible, insulation and artificial crossings known as "monkey bridges" provide a more secure route.

Coan believes that power companies should have a

"mandatory responsibility" to insulate transformers and wires. There's currently proposed legislation to do exactly that. However, some people are skeptical the government will act.

For the moment, much of the onus is on corporations and individuals. Last year, Heubel said, a power company in Nosara insulated dozens of transformers near

Pelada beach, at least in part because of local pressure. "I need to give some credit where credit is due," she said. But she has heard that "now they're putting up new transformers and new lines [to] residences, and they're not insulating them."

Ironically, she pointed out, Costa Rica produces virtually all its electricity from clean energy sources, "then they deliver it in a way that is potentially horrifying."

The question becomes who should pay to make infrastructure safer. Some propose incorporating the cost into consumers' energy bills, though electricity rates are already unaffordable for many. Others suggest higher

taxes on tourism or construction.

At a minimum, activists say, rich expats should ensure their homes are powered responsibly. Often, "it's just a couple hundred dollars," said Heubel. "My hope is that there's a lot of people who just are uninformed as opposed to people who don't care."

To Coan, the mansions and excess in Nosara represent a destructive form of negligence: People are attracted to the town for its rustic tranquility, and yet they are rapidly upending it. "They don't realize you can't take what [you] left in the city to enjoy the beauty and nature here. Don't bring that with you," she said. "Leave it there and leave this here."



This young mantled howler managed to survive an encounter with a live wire and is now quite active. Eventually he'll be released back into the forest.

Coastal Erosion

by Charlotte Foale

Coastal erosion is a concern for many communities and ours is no exception. 17 years ago our turtle nesting season started in March, with leatherbacks the first to emerge, and laying their eggs until May.

For those who were here back in the day, this photo at right of the sign in front of Vista al Mar might be a bit of a shock. A stretch of beach that used to extend 70-100m in front of the hotel, providing ample space for the leatherbacks to lay, no longer exists in their nesting months. This erosion extends along our full transect, driving our leatherbacks to other beaches.

Even the occasional early-emerging hawksbills and greens, who prefer to lay higher up on the beach, struggle to find a suitably safe spot.

While this week we were excited to see the first hawksbill tracks and the first Portuguese man o' war (a leatherback snack - bottom right), this has been tempered by the relentless beach-loss that now dominates our former leatherback season.

Thank you to Mariola, Alice and Emanuel for the photos!



2022 Christmas Bat Count



We were thrilled to participate in the 2022 Annual Christmas Bat Count, led by a team of dedicated biologists from the University of Costa Rica.

Counts took place across Central America, and might have been a little competitive... With only two days to find species, fingers were constantly crossed that the weather would cooperate, and despite some intermittent downpours, our teams sighted 10 species. Not a bad effort, and a LOT of fun!

Counts like this help to provide a snapshot of species distribution across ranges and are a great way to educate about the species in our local area. We make a weekly note of the tent-making bats in the surveys we conduct, but this gave students the opportunity to see some of the non-tent bats that we don't normally seek out.

Many thanks to Bernal Rodriguez and Ricardo Sanchez for including us in this important event, and to all of the people behind the scenes coordinating the international effort!

Charlotte

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