RAPHIA

Newsletter of Caño Palma Biological Station

Tracking Down the Elusive Neotropical Otter

CANADIAN ORGANIZATION FOR TROPICAL RESEARCH & RAINFOREST CONSERVATION

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In This Month's Raphia

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Feature Story

Until recently, the IUCN had classified the Neotropical river otter as Data Deficient. Because of its shy nature, it is little studied. William Dokai (pictured on the cover) came to Caño Palma to change that. He tells the story of how he tracked down this Threatened species in our area of the Barra del Colorado Wildlife Reserve.

About the Author - Will is an undergraduate biology student at Metropolitan State University in Denver, Colorado who plans to pursue an advanced degree in Conservation Biology. He hopes to find his calling working to preserve the biodiversity of fish and wildlife. While he was an intern at Caño Palma in 2016, he kayaked the adjacent waterways documenting otters and their scat by day, and at night took long walks on the beach (AKA night patrol). Like the otters he studied, he likes to spend time navigating waterways in the pursuit of fish. At right, he's pictured searching the world for the elusive Neotropical otter -- or perhaps some other quarry.

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Hiding in the Swamps - Feature Story by William Dokai

As Charlotte started back to the station, she called out: "If you're not back by dinner, we won't come looking for you." Was she joking? She'd dropped us in a fairly isolated area up past Turtle Beach Lodge where the river narrows and becomes overgrown. Just to reach the drop point, she'd had to skillfully maneuver the boat through root wads and submerged logs.

Having slipped our kayaks into the water, Jeroen Snijders, a jovial Dutch student, and I, started paddling upstream in a side channel so narrow that we had to make our way single file. Our goal: Laguna Cuatro in one of the wildest parts of Costa Rica that I have been lucky enough to experience.

Now we could get down to business, or rather the otter's business, as we were inspecting riverside logs for the faeces of the Neotropical river otter. That may not sound stimulating to most people, but I was grinning ear to ear. We quickly began finding what we believed was otter scat on the deadfall logs, and some of it appeared to be fresh. River otters use strategically deposited scat to signal their territory to other otters, and it appeared that we were in otter habitat that was being actively used. We began to take GPS coordinates of the locations of potential samples, paddling slowly towards the lagoon.

Scat on log

Not 20 minutes into the paddle, we saw a brown object break the water's surface, leaving a wide V shape in its wake. We exchanged looks of amazement as we realized that we'd already stumbled upon the Neotropical river otter, *Lontra longicaudis.* There were actually two otters, a mother and her cub, within 20 meters of us. Seemingly unaffected by our presence, they swam towards a log along the bank and hauled themselves out of the water. The mother unceremoniously squatted, arched her back, and defecated on the log. The cub followed suit, and they then quickly disappeared back into the water. This confirmed our suspicion that we had indeed been finding otter scat.

Why Study the Neotropical River Otter?

Conservation biologists have a favorite saying, "We can't conserve what we can't measure". Perhaps this saying best illustrates the urgency of monitoring, globally, as many species and habitats as possible. If we don't have a baseline measurement of a species' demographics, then over time we'll have no idea whether they're disappearing into oblivion or thriving. Such is the dilemma surrounding the Neotropical river otters of Costa Rica. Basic population parameters of the species are unknown in CR though they're listed as a protected species. In fact, CITES names it in Appendix 1, which lists species threatened with extinction (Carvalho-Junior et al 2010). The United States Endangered Species Act lists it as endangered (U.S. Fish and Wildlife Service 2016). Across its range, stretching from Mexico to Argentina, the species is estimated to face a 25% decrease in population in the next 27 years (Rheingantz and Trinca 2015). To determine its current status, and also for long-term monitoring, those baseline population estimates need to be established. Because of the present lack of information, even the most basic demographic information could have potential management implications.

"We can't conserve what we can't measure."

Worldwide, multiple species of otters have demonstrated sensitivity to anthropogenic effects, with some species being extirpated from vast areas of **(cont'd page 12)**

Be Comfortable With Being Uncomfortable by Anna Bandyk

Anna Bandyk is a recent graduate from Glendon College at York University where she majored in Environmental & Health Studies. She hopes at some point to return as a postgraduate in some field related to the environment. At present though, she is taking advantage of her fluency in French, Spanish and Polish (the language of her parents) and working at Pearson airport assisting non-English-speaking people who arrive in Toronto. This relates back to her second major at York: Translation (Glendon has a School of Translation). Anna is also eying the possibility of working in the airport's environmental department.

I remember telling my little sister (also my best friend) that I was going to intern at Caño Palma for 3 months. It would be my longest time away from home. She would not allow it.

I really wanted to be a turtle intern because I wanted to interact with creatures I've never seen in real life. Because of my excitement and/or naïveté, I didn't really give much thought to the realities of working with turtles. The realties are:
a) Turtles are big
b) The ocean is big
c) The dark makes a) and b) 10 times scarier

I didn't expect to be walking so close to the water in complete darkness and my night vision is so poor that I could not trust myself to lead a team as a Patrol Leader. I still don't understand how some people could discern a turtle or her tracks from 50 metres away. Looking back, I think I would have been more at ease as a mammal intern. But, if there were a theme to my story , it would go something like "be comfortable with being uncomfortable".

It took more than a week to actually see a turtle. I remember being secretly relieved each time the leader returned saying "Just a log". I know that sounds ridiculous, but the idea of meeting an enormous, prehistoric beast of the deep sea at night made me nervous. So on the night when I heard "Guys, it's a leatherback!", I knew God was pushing me straight into the deep end. I was terrified, but I didn't want to be difficult either. Why couldn't my first turtle have been the reasonably-sized hawksbill?

The other great thing about your first time with a turtle is that you get to count her eggs. Alone.

So, as I reluctantly positioned myself behind Lady Leatherback for an intimate egg counting session, I realized not only that she was quite smelly, but also that she was just a turtle mama doing what turtle mamas do. I found comfort in anthropomorphizing this turtle and creating a connection based on our biological role as females in the universe (I had too much time for existential and cosmic thoughts).

I counted 39 larger, yolked eggs and 44 yolkless of various shapes and sizes. I also measured her, which took several attempts. The turtle wasn't even that big for a leatherback, which definitely helped ease my nervousness. Since it was my first time in action, the whole procedure did not go smoothly. I did however get over my irrational fear and later worked plenty of turtles, especially during the mass exodus from the sea towards the end of my stay! I still like to brag about touching the largest sea turtle in the ocean and about the one-sided bonding moment I had with her.

Another memorable event happened during the last few weeks of my internship. We were going home around 5 a.m. after a pretty uneventful night and came across the second team who should have been home sleeping by then. As luck would have it, they'd found a Green turtle outside the transect on their way off the beach. This turtle had crawled about 150 metres from the shore to get into the vegetation! She couldn't have chosen a longer route. After she was finished and back in the sea, we helped disguise the tracks and nest, and got home about 7 a.m. The part that makes this story so memorable was when, two weeks later, my team discovered THE SAME TURTLE who decided to lay her eggs in THE SAME PLACE and, coincidentally, at about THE SAME TIME. Not only that, but the same group of people who were **(cont'd next page)**

Be comfortable (continued)

present last time were there! The universe (here I go again) had gone full circle.

I spent most of my time either on the beach or identifying butterflies in San Francisco. My enthusiasm for the butterfly project must have come from me making up for missing out on that childhood stage where you run around with a net trying to catch anything that moves. I promptly decided that the climax of my stay at Caño Palma would involve me catching a large Blue Morpho butterfly.

Another fantastic thing happened related to my quest to capture the Morpho. Since the last couple of days were busy with preparations for the Macaw Festival (I had to finish 3 large paintings and do some transcribing and translating for a video along with my turtle-patrol duty), I didn't have time to hunt for butterflies. On the last day, I pretty much gave up hope that, I would check that off my bucket list. And then a Yellow-edged Giant Owl (*Caligo atreus dionysos*) flew into the office and, with the help of two other people, we caught it! (I wish I could say I caught it alone, which would make the story more awesome. But that would be lying and not fair to Molly and Nick who made my dreams come true.)

My fellow York intern, Lily, had dreams of her own to see a sloth in the wild. She had missed out twice during her stay and on our last day had probably also given up hope of seeing one. But alas! The universe (oh, Anna…) has its bizarre ways. Right after I had enough photos of that giant butterfly, we were called over because a sloth had entered our forests, just steps away from the kitchen! We couldn't believe it! As cliché as it is, Costa Rica really is a magical place!

I saw and learned so much while interning at Caño Palma. I was able to use the skills I arrived with and gain even more. As a mousy human being, I made close friendships and had many great laughs with people from all over the world who came here because they all share the same passion for wildlife and conservation.

Over a year has passed since I arrived with my fellow interns at Caño Palma Biological Station and my sister still hasn't fully forgiven me for "abandoning" her.

Yellow-edged Giant Owl

Wings closed (L) and open (R)

Notes from the Station by Charlotte Foale, Station Manager

Water, water everywhere, but none of it good to drink… the former mantra at Caño Palma.

We receive over 5000ml of rainfall in an average year, and we are surrounded by rivers that wind through the forest, creating islands, and connecting communities, but when it came to drinking, we alternated between filling our cups with sugary drink powder, to mask the metallic tang created by the high iron content of our well water, and addicting ourselves to coffee. We moved, and moved, and moved the well, and while the water always tested as safe, it was never good to drink. In an environment where hydration is critical, we needed to do something.

My addiction to "what to do in case of the apocalypse" posts on Pinterest had me thinking about how we could better utilize our abundant rainfall, and for the last couple of years, we have been dreaming of hooking our toilets, showers and laundry to rainwater catchment barrels. However, around the same time as this idea started bubbling up, a student from Shawnee State University came through, sampling water from around the forest, and found e-coli in all manner of different places, including bromeliads. All of a sudden, drinking rainwater just didn't seem like a good idea – we could chlorinate it, but we would be adding another unnecessary chemical to the ecosystem, and we'd still have to mask the taste.

Then along came self-proclaimed "simple man" Nick Humphreys, who introduced us to Lifestraw filters. He had a personal water bottle with filter inside and was happily drinking canal water. On their website, the Lifestraw Community filter seemed like the solution we'd been looking for. In the corner of our dining room, there now sits what looks eerily like a lunar lander, filtering out bacteria, viruses and protozoan parasites.

While we initially filled it by bucket, Manuel has built a tower behind the kitchen, with pipes extending to the filter, so that refills are straight from the faucet. Imagine that, potable water from a faucet…

While that's probably a daily reality for most people reading this, the beautiful Tortuguero National Park we live in is plagued by water contamination. Samples taken in the nearby village of San Francisco in 2014 showed contamination by fecal bacteria in EVERY well and water tank that didn't add chlorine. The local school was one of the worst.

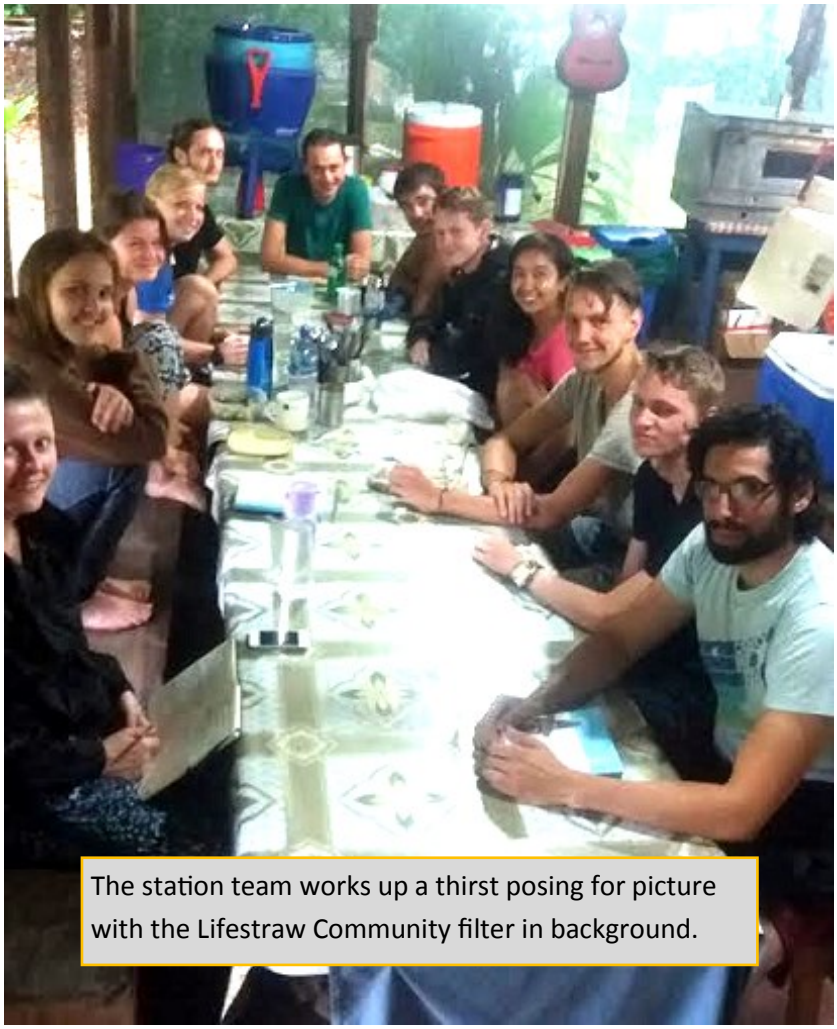
Local news this year has been heavily focused on the water contamination produced by houses and hotels in the Tortuguero area, as black and grey water gets piped directly into the canals, and mixes with fuel spills and litter. Both San Francisco and Tortuguero participate in the *Bandera Azul* (Blue Flag) ecological award, and because of fecal bacteria in the water along our coast, both communities were stripped of their award in 2016. It's a complicated and provocative issue in a flood-prone area that depends on ecotourism for the livelihood of its ever-increasing number of residents. For our part, we'll keep working with local agencies to analyze the issue and its impact on our shared environment, as well as look for solutions.

In collaboration with Shawnee State University, we have at least been able to buy some time for local students, installing a Lifestraw Community filter at the San Francisco elementary school.

As always, we are grateful to our members, and the interns and volunteers who spend time with us. You make our existence and work possible. This month, a special thanks to Jamie Golba, who carried our water filter down from the US, and to the Doctors Minter of Shawnee State University. They not only brought down the filter for the school, but also shared their expertise, and helped us to design a research methodology for testing contamination sources and effects in the local area. We are working on a collaboration with the University of Costa Rica, to move that project forward, and we'll keep you posted!

Manuel constructs tower for rain barrels while Emanuel ponders how he's going to get those blue barrels up top.

Below, the faucet for refilling the Lifestraw Community filter can be seen above the Lifestraw unit.



The station team works up a thirst posing for picture with the Lifestraw Community filter in background.

The Collectors - Why research stations research

"The resistance to anti-fungal drugs is a global public-health problem, and the search for new molecules with these properties is essential and urgent. The discovery (of Selvamicin) came from one of the biggest advantages that our country has: its biodiversity." - Dr. Fernando Garcia, Vice-Chancellor, University of Costa Rica

People are always asking what a research station does. And then when you tell them you once spent some time collecting ants, they want to know why the heck you'd be doing that. Well, as I wearily slogged through the marsh 50 feet behind Emily, I found myself asking that very question.

Emily is Emily Khazan (pictured), a former research coordinator at Caño Palma. Her will to push through that muck is one reason why she's a great researcher. But what about the ants? Did our quest amount to anything? Well, the data are still being analyzed and who knows what might be discovered.

So let's use another example to determine if chasing down ants is worthwhile. Over at La Selva Biological Station, about 60 K west of Caño Palma, researchers found an ant of the *Apterostigma* genus that had evolved a symbiotic relationship with a species of Actinobacteria that secretes an antifungal. *Apterostigma* ants are gardeners, cultivating a fungus that provides the ants with nutrients. The researchers noticed that other fungi were invading *Apterostigma* colonies to feed on the cultivated fungus. And the invaders had the potential to kill off the ant colony. But researchers learned that this *Apterostigma* ant species was using the antifungal from the Actinobacteria to feed the invading fungi, which killed them or at least kept them in check.

As this antifungal was first identified by researchers at La Selva, it's been named Selvamicin. It's very similar in structure to two other antifungals, amphotericin B and nystatin, which are on the World Health Organization's List of Essential **(cont'd on next page)**

***Apterostigma* ant (above) walking on leaf and (R) cultivating fungi in nest.**

All *Apterostigma* ants are hairy.

The Collectors (continued)

Medicines. One reason they're essential is because many pathogens haven't yet developed immunity to them. Hopefully, Selvamicin with its similar structure will have that same ability. In a world where it's estimated that 700,000 people die each year from infections that have become resistant to antibiotics, a discovery such as Selvamicin could be crucial. We know the *Apterostigma* ants being studied have been using Selvamicin against fungi for 50 million years and so far the researchers have found that it still does the job without the targeted fungi developing immunity. Further research will show if that remains true when Selvamicin is used with humans.

Unfortunately, both amphotericin B and nystatin cause serious toxic reactions in humans. In studies so far, Selvamicin has not shown such severe side effects. But will it be potent enough to be an effective substitute for amphotericin and nystatin? Tests have so far shown that Selvamicin is effective against *Candida albicans*, a fungus common in humans, which frequently causes infections of the skin, throat, mouth, genitals and blood.

Will Selvamicin beat the odds and become the antibiotic researchers are hoping for? Well, we won't know for a while as it takes years for a drug to gain regulatory approval. But the discovery of Selvamicin answers the question of why the heck we go out collecting ants.

Collecting is a significant part of research at Caño Palma. In his article on Page 4, William Dokai indicates that the collection of scat is essential to building our knowledge of the Neotropical otter, knowledge that could be used in raising the survival odds of this endangered mammal. Emily Khazan's ant collecting could lead in the same direction as the La Selva research. I also accompanied Emily as she collected samples of midge larvae and pupae from foam in the canal. These samples went to La Selva and, who knows, they could also lead to important findings.

So collecting is one reason why research stations are important. Tell your friends.

Actinobacteria -- Giving Bacteria a Good Name

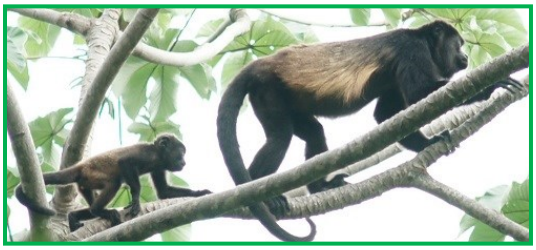
Before WW2 and penicillin's discovery, we had a world without antibiotics to fight infections. An incalculable number of deaths resulted. Since then, the phylum known as Actinobacteria has been utilized in the development of over 50% of all antibiotics. Some examples you might know are streptomycin, neomycin, erythromycin and the tetracyclines. They can be antifungals, antibacterials, antivirals, antithrombotics (reducing blood clotting), immunomodifiers (augmenting allergic response), antihypertension, antitumor, enzyme inhibitors (to kill pathogens), insecticides, or herbicides. Actinobacteria also play an important role in decomposing organic matter and nitrogen fixing.

***Apterostigma* ant nest in Limon province**

"These [Apterostigma] ants are farmers, as they grow their own food, but also pharmacists, as they manufacture their own antibiotics through their relationship with bacteria," - Adrian Pinto (University of Costa Rica researcher)

Notes from the Chair by Kymberly Snarr

Twenty-five years ago I was introduced to COTERC and Cano Palma Biological Station during a University of Toronto field trip. We were the first group of students to the station and amongst the large fronds of Raphia trees, I gained field experience which led me down an exciting career path. Walking the newly established *Calibri Sendero* (Hummingbird Trail) and paddling the canal in the dugout canoe, we followed troops of mantled howler monkeys, viewing their unusual blonde markings while they tried to untangle the mystery of the tangled mats of lianas in search of young leaves, hanging fruit, and blossoms to eat.



Learning to keep proper notes and being introduced to this secondary lowland humid forest were exciting times. Each time I've returned to the station, I'm still filled with a sense of urgency in documenting what is happening in the region in order to reveal the happenings to the local and national environmental offices, and out into the global circles. At all scales, this biodiverse region continues to house common, rare, and complex aspects of ecology that are being lost at too fast a rate. Secondary and regenerating forest runs from where the station lies north up into Nicaragua [see map on Page 12]. This contiguous piece of forest is key to the survival of many species of flora and fauna. In my career as an Environmental Anthropologist, I have worked in China and Central America. As a nearly retired academic with ongoing work with Laurentian University and in the organic agricultural sector, I am now able to focus more energy on continuing the COTERC mission.

Over the past 10 years, I have been on the COTERC Board in various capacities. Currently, I sit as the Chair. COTERC is grateful for the work of Vice Chair Shelley Hutchinson, Director of Marketing Patrick Traynor, others on the Board, and former Board members who stepped up following the death of our founder and former Chair, Marilyn Cole. The Board has had a number of newcomers over the past few years bringing continued support for ongoing work and fundraising ideas, along with new ideas on how to move forward with new approaches that COTERC and the station can benefit from. Two newcomers are Dr. Roberta Fulthorpe, University of Toronto (https://csb.utoronto.ca/faculty/roberta-fulthorpe/), Director at Large, who visited the station a year ago, and Megan Joyce, a former intern in the York International Internship Program (http://yorkinternational.yorku.ca/go-global/intern-abroad/) who is Director of Special Events. All Directors have a positive energy and are working together to continue moving the mission of COTERC forward.

Based on past projects in Canada and in Costa Rica, COTERC is focusing on where we are now while keeping an eye to the organization's future. In particular, we always have to strive to meet our goals in education, conservation and research. In Canada, we are upgrading educational items. For the station, we are strengthening our fundraising efforts to support various flora and fauna monitoring projects as well as maintaining current staffing levels. I have always envisioned the station as becoming self-sufficient for staffing and operations with infrastructure needs being met through fundraising. Following the global financial downturn a few years back and increased global terrorism, the station has seen a mild reduction in numbers. While a healthy budget is in place, the wear and tear on infrastructure continues to 'eat' away at station funds. COTERC aims to provide needed monies to the station for updating infrastructure such as the much-needed dock renewal and developing new projects such as the Marilyn Cole Memorial Lab (see: http://www.coterc.com/). We are currently discussing how we can accomplish this. I'd like you to see yourself as part of this plan – make yourself part of this plan. Volunteer in Canada, volunteer at the station, come to our fall fundraiser (http://www.coterc.com/store/p29/FiestaVerdeTickets.html) and dedicate yourself to filling a table with friends or family who can learn about the rainforest. For those of you who are not in Ontario, Canada, feel free to make a donation to COTERC at http://www.coterc.com/donate-now.html. All donors receive a tax receipt.

I wish all of you a safe summer and hope to hear from you personally about what you can do or your views on the path that COTERC should take.

Hiding in the Swamps (continued from page 4)

their former range. Habitat loss, water pollution and human persecution have all been documented to harm or eliminate otter populations, and all are threats to the Neotropical otter in Costa Rica. However, until baseline population estimates are acquired, no one can say for sure if CR's otters are about to meet a similar fate.

Caño Palma Biological Station is in an ideal location to begin to study this semi-aquatic and widely distributed carnivore (Trigila et al 2015). Barra del Colorado Wildlife Refuge represents one of the largest areas of protected rainforest in Costa Rica. Beyond the refuge, a series of protected areas stretches north and west into Nicaragua, and south and east into Panama, forming an extended biological corridor. These attributes, combined with Barra del Colorado's abundant rivers and canals, make this area a potentially important habitat for *L. longicaudis.*

"Caño Palma Biological Station Is An Ideal Location."

My Role

As a mixed-taxa intern at Caño Palma in the summer of 2016, my duties were varied, but my focus was to work on an otter pilot study of sorts. To determine the feasibility of future studies of *L. longicaudis,* I began a literature review along with fieldwork to look at how the Neotropical river otter could be enumerated within Barra del Colorado.

In the wild, the Neotropical otter is wide ranging and elusive. Furthermore, they lack any natural markings, which could be used for visual identification.

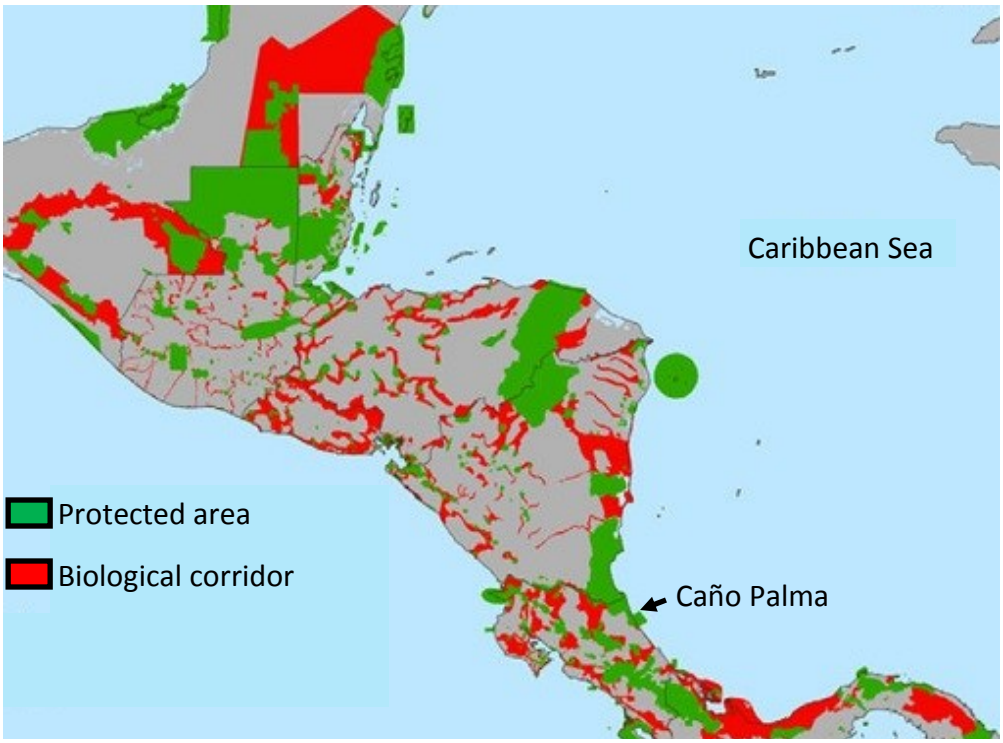
It was immediately evident that the most practical as well as the least invasive method of studying otters would be faecal genotyping. Using faeces as sources of DNA, individual otters can be identified through genetic analysis. From this information gathered over several sampling events, and using a mark-recapture framework [see Page 13], reliable population estimates can be drawn. Non-invasive faecal genotyping has previously been utilized by biologists studying several different otter species, including *L longicaudis*.

Like any method of biological study, this technique has benefits as well as potential drawbacks. Collection of the scat samples is straightforward, and requires relatively little expertise or resources. Teams of two people in kayaks can easily collect them. Another benefit is that it is completely non-invasive. No otters need be captured or even observed for the study to succeed. The importance of this was quickly realized because, during most forays into the wild, the otters were never seen. The scat however is readily visible, abundant and, with a little experience, easily and reliably identified.

The potential drawbacks come into play with the genetic analysis. Permits would be needed in order to export samples unless a facility in Costa Rica can be found to analyze them. Furthermore, the process of genotyping faecal samples is somewhat technical, and also labor and resource intensive. When properly carried out, it would not be inexpensive.

However this should not be a deterrent for Caño Palma to proceed with river-otter research. Securing funding for the genetic analysis is by far the biggest obstacle. Finding an interested Master's or PhD student with funding is perhaps the most promising solution. Alternatively, a partnership of sorts with a university could provide the facilities and funding necessary to proceed with genetic analysis.

Caño Palma means many things to the multitude of people who volunteer there. For some, (cont'd on next page)



Hiding in the Swamps (continued)

it will always conjure up memories of strawberry dart frogs and eyelash pit vipers. For others, it will be encounters with the majestic sea turtles in the profound darkness of a wilderness beach. Or perhaps it would be the prehistoric sound of howler monkeys greeting the first sunlight of the day with a chorus of vocalizations. Indeed I share these memories, but foremost to my own experience, I will always remember the days I was lucky enough to spend kayaking around in search of scat, and perhaps a glimpse of one of the most beautiful and elusive creatures I have ever seen, the Neotropical river otter.

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Mark and Recapture

Mark and recapture is a method commonly used in ecology to **estimate** the size of an **animal's population** when it's not practical to visually count all the individuals in the population. To start, a portion of the population is captured, marked, and released. Maybe a week later, another portion is captured and the number of previously marked individuals within this sample is counted. It then comes down to simple ratios:

$$\frac{P}{M} = \frac{C}{R}$$

P = Population (estimated) – the unknown in the equation
M = # of animals marked in the first trapping
C = # of animals captured in the second trapping
R = # of marked animals recaptured in the second trapping

Translated, that means, the total population (P) divided by animals captured and marked in the first session (M) will be the same ratio as the total number of animals captured (C) in the second session divided by the number of previously marked animals recaptured (R) in that session.

But animals such as otters are elusive. Capture isn't easy. Instead, William collects individual faeces samples as a substitute for capturing the actual otters. By analyzing DNA obtained from their faeces, individuals can be identified. Maybe a week later, a second collection of faeces samples is made, DNA analysis is done again, and individuals identified. Now you're in the same position as the person who actually marked animals. You know how many individuals in the second faeces collection match up to faeces you collected in the first sample. So you can use the same equation and come up with a pretty good population estimate.

Will's Legacy

Information provided by Molly McCargar, Research Coordinator

Will blazed the trail – or at least the canals – in surveying for otters. To carry on his efforts, the station is now surveying 4 transects: north and south of Caño Palma, Laguna Cuatro, and Tortuguero National Park (Caño Mora and half of Caño Chiquero). Surveyors take GPS coordinates of all indications of otter activity including: scat, anal jelly, tracks, holts (lairs) and visual encounters.

At a scat or jelly site, they measure:

- the distance from shore
- the canal depth
- the height of a log (if scat or jelly is found there) from the water's surface plus the log's diameter.
- age of the scat
- water turbidity
- percent vegetation cover

So, what is this data used for? Well, two interns completing an applied bachelor's program in animal management are currently carrying out projects using this information. One is focusing on scat in its role as a territorial marker by using the percent of vegetation cover to see if higher coverage and thus less shade (increasing longevity of the scat) is favored, or if less coverage and more sun penetration (making the territorial marker more obvious) is favored. The second intern is using data such as water quality, water turbidity, water depth, height of the fallen log from the water's surface, and diameter of the log along the different transects to determine habitat preferences of the otters. These projects should be finished by mid-August.

The next issue of *Raphia* will have a more complete summary of the work of these two students.

The Art of Sprainting

Though it sounds like it may be some obscure type of art or even just a contraction of the word 'spraypaint', spraint is actually another name for faeces, specifically otter faeces. And it's not called sprainting because otters use it to spruce up their surroundings. Rather, otters use spraint to mark their territory. As well, most species of otter roll around in their 'spraint heap', a deposit of the faeces of all family members. This gives each of them the group scent, which helps them recognize each other and build a bond between family members. (Neotropical otters don't do the 'spraint heap' roll as they are solitary critters.)

These are the newly laid steps to the station library, not Vanier College

Fact Sheet -- Neotropical River Otter (Lontra longicaudis)

Range - Mexico to Uruguay and northwest Argentina.

Conservation Status: Near Threatened (IUCN) with a decreasing trend.

Length: 90-150 cm (35-59") Tail is about a third of length. Males are about 25% larger than females.

Weight: 5-15 kg (11-33 lbs)

Diet: Fish (about 67%), crustaceans (about 28%) – but can vary widely by locale. Opportunistic.

Threats: Until the 1970s, it was hunted for its pelt, resulting in local extinctions. Estimated that 30,000 otters were killed annually in Columbia and Peru. Today, deforestation and water pollution are main concerns. Now killed mainly where fishermen and fish farmers view them as pests.

Habitat: *L. longicaudis* is found in a wide variety of habitats, but basic requirements are water (usually fresh but can be brackish or even saline), good tree cover and potential nesting sites. Found from sea level to 1500 m.

Fur: Short and dense with 2 layers. Besides acting as insulation, the outer guard layer keeps the fine undercoat dry. It's a lustrous grayish brown with creamy tinting on the throat and muzzle.

Life: Solitary, diurnal creatures. Burrows are near water with high food availability. Male and female only associate briefly for mating purposes. Usually 2 or 3 pups. Young don't open their eyes till their eighth week and enter the water in their eleventh week. They are born fully furred.

Foraging: Use prominent vibrissae (whiskers) to detect prey vibrations underwater, helping otters to feel the movement of prey even when the water's dark or murky. Dives for food last 20 to 30 seconds.

Etymology: The word otter can be traced back to an ancient Indo-European word meaning and sounding like 'water'.

Fast Fact: An otter's metabolism and highly active nature mean that it must eat up to 15% of its body weight in food every day - which makes for a lot of scat.

Eating fish

Pup with mom

Steve Gillis - New Face at COTERC

As a restoration ecologist for 13 years, Steve currently works with the Niagara Peninsula Conservation Authority. And what does a restoration ecologist actually do. Well, they restore habitat that has been damaged or even destroyed. Steve has been involved in over 300 restoration projects throughout the Niagara area, Toronto and the Frontenac Arch**. His work has involved wetland restoration and creation, riverine and aquatic habitat restoration, reforestation, and the renewal of grassland habitat.

Steve graduated with a Bachelor of Science in Biology and a post-graduate diploma in Ecological Restoration. Most importantly, Steve is a father to two incredible young girls. To further the work of COTERC and the Caño Palma Biological Station, Steve has been working on researching and writing grants since March.

***The Frontenac Arch Biosphere Reserve – The actual arch is an ancient granite bridge that extends from Algonquin Park in Ontario to the Adirondack Mountains in the USA. UNESCO designated an area of 850 sq. mi. running along the St. Lawrence River from Gananoque to Brockville and expanding out to the northwest as a biosphere reserve to protect what has been called the most biodiverse region in Canada. Five different forest regions meet in the area.*

Station Happenings from reports by Molly McCargar, Research Coordinator

March

This month saw an invasion of the EURI's (European interns). Among those were 4 Dutch and 2 German students who will be on base for 5 months. Their work will cover a lot of territory.

Sea-turtle nesting - Marieke Zobel (HAS University) will be using the station's long-term data from the sea-turtle monitoring program to study the length of incubation periods and nesting success. This is valuable research for the station as there has been a shift in the peak of the green turtle nesting season from August to September. As such, it will be crucial to determine whether this shift has an effect on the incubation period and/or the success of our nests.

Tent-making bats - Though tent-making bats (at right) are difficult to find, they are favorites for visitors because of their ingenuity in constructing roosts by cutting and folding leaves. Previous station research on their habitat compared their activity before and after the construction of the concrete path on the Cerro. Huub van Gijn and Ingmar Rondeel (Van Hall Larenstein Univ. of Applied Sciences) will be continuing this research. Initial data showed that, post-construction, the bats increased their use of tents for feeding and decreased use for roosting. Huub's research will hopefully show whether this shift in habitat use is persisting now that plants destroyed during construction have regenerated.

Ingmar will be studying whether tent-making bats will use tents that they construct out of the same type of leaves that the bats normally use. Limited data from last year showed no evidence that they used artificial tents. However they did appear to construct more tents on the trees where artificial tents were placed.

Bird Diversity - As birding is one of the primary tourist draws in the area, cataloguing diversity in the village of San Francisco may help with increasing sustainable ecotourism. Danny Bregman, also of Van Hall, will be focusing on this.

Neotropical Otter - The German contingent from Van Hall, Ronja Haring and Johanna Martz, are doing projects on the Neotropical river otter. More detail can be found on Page 14 in "Will's legacy". Look for more about their work in the next issue of *Raphia*.

April

Management intern - Erin Rehm (USA) arrived to take up this position. She will be assisting staff with administrative duties, providing support in training interns, and assisting on surveys and in the community.

Snakes – A total of 29 snakes of 12 different species were captured this month. One survey set a station record with 10 snakes captured. Included in this total was a collared snake (*Enulius flavitorques*) (pictured at right), a new species for the station. In fact, range maps don't show that it occurs in our area.

May

Mammals – We're #1. For the second consecutive month among our 3 survey locations, the station had the most mammal detections as well as the greatest diversity of mammals . Tortuguero National Park usually leads in both categories. And, for the second month in a row, surveyors found tracks of a Baird's tapir near the station, a relatively rare occurrence for this transect.

Nicole Allison (UK) departed this month to return home and write up her thesis on nest-site fidelity in green turtles. In addition to station data, she was able to obtain data from the Sea Turtle Conservancy (STC) in Tortuguero.

Station Happenings (continued)

Sea Turtle Monitoring

Nesting activity: Leatherbacks and hawksbills showed a great increase in May compared to the same month in 2016. This contributed to the large increase in year-to-date numbers:

	May/16	May/17		Total 2016	Total 2017	
Leatherbacks	3	10	+7	11	19	+8
Hawksbills	3	11	+8	1	13	+12
Greens	-	-		1	1	-
Total nests	6	21	+15	13	33	+20

Poaching – May was troubling as three nests were depredated during the month. As well, there was one failed attempt where poachers couldn't locate the nest. Bamboo protection barriers continue to be placed atop all triangulated nests.

Human Impact – White lights remain a main issue, notably the bright flashlights that the security guards at Turtle Beach Lodge use at night in prime turtle nesting areas. However things may be changing after a green turtle got lost on the Lodge's grounds, having been attracted by their lights. As a result, they swapped their bright white lights for lights with softer colors. Coincidentally or not, sightings of security guards with flashlights were reduced in May compared to previous months.
Locals using white lights were also an issue. This peaked around Easter in the vicinity of a couple of residences near the beach.

MINAE – We are sending monthly reports to MINAE, the Ministry of the Environment and Energy, on both turtle activity and human impact on turtle nesting areas. By keeping lines of communication open with them, we maintain a good relationship.

Collaboration and Outreach

•Last year the village of San Francisco lost its **Bandera Azul** (Blue Flag) certification. This was due to the villager's lack of participation in beach cleanings and the lack of concern from local authorities about the water quality of their river and beach. We are collaborating with the community to assist in recovering their certification. A group from a local university is going to participate in beach cleanings over the next months.

•Recently the station was asked to participate in the development of a management plan for the **Archie Carr Wildlife Refuge**. Station staff are happy to collaborate with Tortuguero National Park if there is development in this area that can be a tourist and wildlife corridor between the Park and the Cerro. This could lead to the creation of more opportunities for the local community to improve their life quality as well as encourage more participation by local authorities.

Building A Road to Tortuguero - From the *Tico Times* and *Raphia* - 1996

The unauthorized clearance of a 30-metre wide swath of rainforest for construction of a road to connect the isolated Caribbean town of Tortuguero to the rest of the world fanned heated controversy and anger this week.

Last Friday, a team from the Tortuguero Conservation Area discovered that a tractor, apparently hired by the municipality of Pococi, had cleared the way for a road passing through as much as 3 kilometres of Tortuguero National Park. The Conservation Area announced it will present a criminal complaint today.

"They don't have permits to enter the Park," an angered Conservation Area director Luis Rojas said. "We won't allow anyone to build a road". Rojas told the Pococi municipal executive months ago that the road, which follows the power lines from Palacios to Tortuguero, could not enter the Park.

Pococi municipality vice-president Johnny Vargas said, "We are using the pathway that all Costa Ricans have the right to use." He said the road's construction had the support of the majority in the area.

On Thursday, Park officials reportedly seized the keys of the tractor from the driver.

"We openly condemn this, both morally and legally," Minister of the Environment Rene Castro said, promising "strong punishment" for those responsible. "Pococi municipality made a mistake and it will have to assume full responsibility."

The road passes through land recently acquired by the Tortuguero National Park as part of the 'biological corridor' between the Park and Barra del Colorado Wildlife Reserve.

The municipality has permission and a budget to build the road as far as the Park entrance, about 4 kilometers from Tortuguero. Road proponents say it will allow greater access to Tortuguero, which can only be reached by plane or an 85-K boat ride from Limon.

Rafael Morera, who lives beside the new road, defiantly said, "For 20 years, this has been a road, but it has only been a park for 2 years, and you can't deny people a road." Although he admitted no cars have ever driven what till now has been a footpath, he bluntly stated: "A road is a road."

In response, Rojas said "It's a service path that has never been a road."

National Agrarian Party Deputy Victor Hugo Nuñez, who has earmarked 10 million colones for the project said "As long as there is not safe transportation in the zone, you can't deny the town transportation via road. People are exaggerating when they say the road goes against the area's ecology."

However, road opponents fear it will eliminate the charm of the area that draws tens of thousands of tourists annually, providing almost all the area's income.

Conservationists fear it will also allow for greater destruction, both in the threatened Caribbean lowland and on the beach, the most important nesting place for the endangered green sea turtle.

"What is not being discussed is what else roads bring besides education and health care", noted Jan Schipper of the Caribbean Conservation Corporation, a turtle protection group that has been in the area for over 20 years."

"First and foremost is that a road opens up the region to logging, monoculture plantations, agriculture and hunting," said outspoken tourism operator Michael Kaye. He continued: "With access roads, any and all private or disputed property will be harvested on the fringes of the protected areas, leaving in their wake two separate forests where there once existed one. This will bring crime, drugs, overpopulation, deforestation, interruption of animals' ranges, and the biggest negative impact will be its violation of the integrity of the park system, My feeling is that if it keeps up the way it's going on a long-term basis, this might end tourism in Tortuguero as we know it. It would convert Tortuguero into another Caribbean mass-tourism destination."

Enrique Obando, president of the Tortuguero Community Dev't Association (the closest thing to a local government) said he'd like to keep the road from being built. But, at a community meeting yesterday, he said the association would join with hotel owners in opposing the road only if the tourism industry agrees to help resolve the town's transportation problems by providing a boat and motor for public transportation as well as working with the community to resolve health care, refuse disposal and educational problems. The association is not going to put up any opposition to the road unless the tourism industry gives something to the town.

What could have been the charm of Tortuguero National Park

Marilyn's Reply

Feb 1, 1996

To the editor of the *Tico Times*:

As foreigners and guests in the country, we have maintained a politically neutral position and do not want to interfere with the Costa Rican political or legal process. However, we can no longer stand by without commenting on the recent developments regarding the illegal construction of a road through Tortuguero National Park. This issue goes beyond the question of legalities. The concerns of the people of Tortuguero, which include transportation, health care, education, etc., should be addressed.

Tortuguero is an area rich in biodiversity. It is unique because it contains one of the most endangered ecosystems in the world. The village and national park get their name from the green sea turtle. Tortuguero beach is the largest nesting area in the Caribbean. The surrounding rainforest with its maze of canals and lagoons provides an ideal habitat for the thousands of plants and animals that make it attractive to both tourists and scientists.

With an extremely high percentage of local residents working in tourist-related businesses, the people depend on the biologically rich environment to provide them with a living. However a road is a short-sighted option because, along with the short-term benefits it might bring, it raises concerns that over the long term, there will be increased stress on the ecosystem through deforestation, pollution (the area already has a serious waste-disposal problem), poaching and squatting, to name a few.

How then does a community provide itself with the basics it needs without destroying the very environment on which it survives? The Tortuguero National Park is just that: a national park. Not just for the people of Tortuguero, but for all Costa Ricans for generations to come. In addition, all Costa Ricans in principle benefit from the tourist dollars that pour into the park system and trickle down to other sectors through related industries.

We believe an answer lies with the Costa Rica government and the international community. The local lodge owners have been approached for solutions and have already initiated the first of several measures to address the concerns of the community. This is a commendable action on their part; however, the responsibility is not entirely theirs. If the powers-that-be determine that the survival of one of the most important ecosystems in Costa Rica is worth saving, something must be done soon. Government assistance in addressing local concerns of transportation, health care, education, etc. is worth investigating. The people of Tortuguero have something to be proud of and have shown this pride by resisting a road for so many years. The pressures of the outside world have finally found their way into the "turtle bogue". Progress is inevitable but should be well guided. Tortuguero has the opportunity to avoid the old development schemes which have proven damaging to natural areas. It has a chance to work for alternatives which respect the uniqueness of an area like Tortuguero.

Yours truly
Marilyn Cole

Marilyn's Cousin Remembers by Patti Cole-Stever

I am Marilyn Cole's first cousin, and I am filled with great sadness and loss as I write this in memory of my beautiful cousin. As you well know, Marilyn was an amazing, gentle and kind lady. Sorrowfully though, her mind was filled with the heartaches of all the animals of this Earth and the impact that we humans have on their environment – indeed on their existence. She was tireless in her efforts to seek and bring forward the brutally dirty secrets, exploitation and horrific threats and consequences to species that far too many animals suffer at the hands of *Homo sapiens* for our pleasure and entertainment. For this I have and always will thank and applaud her.

Marilyn was my favourite cousin, a bit older and wiser than I, and I will truly miss her soft-spoken but keen manner and willingness to give so generously of herself. She loved her gorillas at the Zoo, her two meerkats and her dog Ripley. She lived a clean, simple, respectful life and I pray that she rests now in peace, knowing that she **DID** do something to effect change and awareness while many of us only talk about it.

I hope that Marilyn's vision for COTERC and its mission carry on.

Update on the Nicaragua Border Dispute

A couple of years ago, Raphia *featured the story below, which outlines a brief history of border disputes between Costa Rica and Nicaragua. When originally published, a final court case was pending before the International Court of Justice (ICJ) in The Hague that involved the San Juan River and its delta area, just north of Caño Palma. In December 2015, the ICJ issued its (almost) final ruling, which you'll find on Page 22.*

On the Border North of Caño Palma

To settle border their border, Costa Rica and Nicaragua signed the Cañas-Jerez Treaty 159 years ago. Since then, disputes occasionally arose. But, for the past 17 years, Nicaragua has intentionally sought to increase tensions along the border with most of the issues centering on the delta region just 25 miles north of Caño Palma.

It all started almost 200 years ago in 1821 when the Federal Republic of Central America declared its independence from Spain. The Republic was a loose federation of Guatemala, El Salvador, Honduras, Nicaragua and Costa Rica. At the time, Nicaragua was larger, extending south into Costa Rica as far as the Nicoya Peninsula and Limon. But residents in Nicaraguan areas that are now Costa Rica soon seceded to Costa Rica, and Nicaragua lost about 11,000 square miles of territory.

The Cañas-Jerez Treaty of 1858 established that the eastern third of the border was to follow the Rio San Juan with Nicaragua having sovereignty over the river itself. Costa Rica was awarded certain navigation rights. Since the border followed the main channel of the San Juan right to the Caribbean Sea, this resulted in Costa Rican territory bulging into Nicaragua in the delta area. This piece of territory (called Calero Island on the map) is surrounded by Nicaragua on all but its southeastern side.

The delta basically remained quiet until 1998 when Nicaragua started to exert greater command of river traffic. It took till 2009 for this dispute to be cleared up by the International Court of Justice (ICJ). It confirmed Costa Rica's transit rights from the Cañas-Jerez Treaty and denied Nicaragua's demands that passengers on Costa Rican boats obtain a Nicaraguan visa or tourist card.

The dispute again heated up when Daniel Ortega was looking for populist causes to further his ambitions. By picking fights over territory with Costa Rica, he was sure to stir up nationalist feeling in Nicaragua. He even resurrected Costa Rica's 1824 annexation of Guanacaste province (which Nicaragua accepted in the Cañas-Jerez Treaty).

In the delta area, Ortega's territorial claims have another purpose. A redrawn border would help support the Sandinista's expansive offshore-oil claims. Starting in 2010, Nicaragua frequently provoked Costa Rica by entering its territory. In one bizarre incident, they set up dredging operations supported by 50 soldiers and then said that they were only going by Google Maps - which had mistakenly shown the border as matching the line claimed by Nicaragua.

In 2011, claiming it was protecting its national sovereignty, Costa Rica started building a road that will run along its entire river border with Nicaragua. Once again, Nicaragua responded by taking Costa Rica to court, claiming that road construction is causing environmental damage to the river and its wetlands. The ICJ, in 2013, rejected Nicaragua's complaint. However, further claims and counterclaims are still being adjudicated. So, 159 years after the border was settled, the squabbling persists. (Update on next page)

ICJ'S Ruling & What Has Ensued

Let's start by quoting the *Tico Times*:

"Most of the court ruling favored Costa Rica in the 5-year dispute. Justices unanimously found that Nicaragua violated Costa Rican territory by invading Isla Calero with military personnel, by dredging canals in Costa Rican territory, and by violating Costa Rica's navigation rights on the San Juan River, a natural border between the two countries. Nicaragua also was ordered to compensate Costa Rica for damage caused to its territory."

On the other side, Nicaragua's claim for environmental damages caused by the building of a road along the Rio San Juan by Costa Rica was rejected - though the court did say that Costa Rica violated its obligation to conduct an environmental-impact study before building that road along the river's bank.

In accordance with the Court's ruling that Nicaragua was to compensate Costa Rica for environmental damages and other costs associated with Nicaragua's illegal dredging of the Isla Calero wetlands in 2010, Costa Rica has asked for $6 million. In December 2016, Nicaraguan President Daniel Ortega indicated that his government accepted the Court's ruling while disagreeing with the amount of compensation Costa Rica requested. Yet Nicaragua has never responded officially, so Costa Rica has asked the ICJ to decide the amount.

As well, in February of this year, Costa Rica was back to the ICJ as Nicaragua had set up a military camp on Isla Portillos at the very tip of Isla Calero. In their December, 2015 ruling, the Court had said "that due to significant changes along the coastline over several decades, it is difficult to make a precise border delimitation at that location." At least, they're down to arguing over a sand bank.

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https://www.canadahelps.org/en/donate/

Click on "Find a Charity"

Type in COTERC and then follow the instructions.

Whether the amount is $5 or whatever, your donation is greatly appreciated - and Canada Helps issues a tax receipt directly to you.

COTERC would like to thank the following individuals for their generous donations that will assist in furthering the research we do at Caño Palma.

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Vanessa Phelan	

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We welcome any comments or suggestions from our members to ensure you feel involved. If you have an idea for an article, or better yet, would like to write one yourself - if you have a photo or two that you think we could use - if you have a suggestion for improving Raphia, please send it along to us at directoratlarge4@coterc.org

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