

RAPHIA

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Newsletter of Caño Palma Biological Station



IN THE BEGINNING



**COTERC & Caño Palma :
Celebrating 30 years
of discovery**



Why Caño Palma Matters by Dr Brock Fenton

Prof Fenton brought students (on cover) to Caño Palma in its early days. Here he outlines why a station such as Caño Palma is so valuable, not just for research, but also for the development of people as they figure out if research could be their calling.

I think that field stations, such as Caño Palma, play a fundamental role in research and education. First, they are a haven where you can conduct your work and not be distracted by other goings on. Second,



they give you access to sites and organisms that are otherwise entirely out of reach. Third, they are places where you meet and engage with others over common interests and ideas.

On the education side, it's extremely valuable to watch students land in a neat setting and then make their way on their own projects or on common goals. This means watching people learn by their mistakes, picking up stimulation and ideas by interacting with colleagues, and finding their way through the briar patch of personal interactions and interplay. And, in a biodiversity hotspot like Caño Palma, they have the opportunity to consider other species and lines of inquiry as their specialist subject.

The main highlight of Caño Palma for me was getting to know *Thyroptera tricolor* (Spix's disk-winged bat) ... watch them, photograph them, watch other ideas generate. Sometimes the impact is immediate. On other occasions, one returns to a station (or has others go there) to take up neat lines of research.

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30 years

The Caño Palma area is a biodiversity hotspot. As we look back on the station's 30 years of existence, we can take pride in the fact that researchers from all over the world have come to study the incredible variety of flora and fauna.

But 30 years brings a lot of change. Our cover photos, from the early days of Caño Palma, demonstrate that. The hut housed the outdoor kitchen. Standing in front of another rudimentary structure is an early group of students from the University of Toronto. Led by Dr Brock Fenton (in blue t-shirt on the left), they came to the station to research bats -- the number of species is now at 44 and there are likely many more to be found. A new one was added as recently as last month.

But, like the bat numbers, things change. The kitchen, with adjoining dining area, is now indoors and modernized. Some of the students are now leaders in their chosen fields. Some bat species have become endangered, all the more reason to do further research. Even the climate's changing with consequences that demand we study them. For example, station manager Charlotte Foale is concerned with beach erosion, possibly caused by a rising sea level. This could have negative consequences for the endangered sea turtles that nest along Playa Norte. What can the station do about sea level? Not a lot. But, led by present research coordinator Morgan Hughes, we're looking at possible measures we can take to lessen the impact on the beach.

And so it goes. The world changes. The issues change. And Caño Palma adapts to make ourselves relevant to science and to you.

DD

Previous issues of *Raphia* are available at - <http://www.coterc.com/raphia-newsletters.html>

Fiesta Treinta -- 30th Anniversary Event

FIESTA TREINTA
SAVE THE DATE
SEPTEMBER 25 2021

We're celebrating 30 years of COTERC & the Caño Palma Biological Station with an international virtual event and we need your help.

Please send us your people pics! Send 2 or 3 photos featuring people either at the station, at a COTERC event or both.

Email them to marketing@coterc.org



Photo
by
Bert
Jan
Assink

COTERC's Annual General Meeting

Thursday June 10th 2021 @ 7 pm

Due to Covid-19 restrictions, this year's AGM will take place on Zoom. If you wish to take part, you can obtain a link from Dr Snarr at chair@coterc.org. Please contact her from June 3rd to 8th and she will send the link to you.

This year, we have a number of positions up for election. If you are interested in being part of the Board, please contact Dr Snarr or any Board member - there's a listing on the final page of *Raphia*.

We are always interested in welcoming new people to the Board. Since meetings are presently held via Zoom, you can reside anywhere and still attend.

COTERC -- The Early Days by Lynn James

COTERC founder Marilyn Cole said that Lynn never missed volunteering at a single event of any kind. Whether it was organizing, crafting or fundraising, she was there. Our heartfelt thanks to you Lynn. Now let's let Lynn say a few words about COTERC's beginnings.

Marilyn and Ozzie purchased the land that was to become Caño Palma Biological Station in 1991. They were driven by a belief in the global importance of tropical rainforests and the strong desire to conserve this beautiful piece of coastal rainforest.

So was born COTERC, the Canadian Organization for Tropical Education and Rainforest Conservation. Quite the mouthful, but it well describes what we were about. However, educating Canadians on the importance of rainforest conservation in far-off Central America was a daunting task.

The station was to become a place for the study of conservation science and research into local flora and fauna. Our goal was for it to become as financially self-sufficient as possible. To generate income from paying guests, we would need accommodations, cooking facilities, power, transportation, scientific equipment and many other sundry items.

That required funds and we tried it all! Indeed, without the continual fundraising efforts put forward by all COTERC members, Caño Palma would not have survived. Though most of us would never get to visit the station, everyone worked hard in whatever way they could to support a project they believed in.

Memorable fundraising events included: Many, many, (so many) store-sponsored barbeques. Numerous garage sales. Trade shows galore. The annual Tropical Treat with auctions, raffles and guest speakers.

Plus: School presentations. Presentations to cubs/scouts and other interested groups. Regular talks by volunteers, mostly from the Toronto Zoo, on the global importance of rainforests and their impact on climate. A slideshow on COTERC highlighting the work going on at Caño Palma. Annual field trips to the station for an all-inclusive cost, which included a donation to the organization.

All these activities needed a great many volunteers. In fact, most of us who volunteered also co-opted our family and friends into helping out.

Many of the items needed for the running of Caño Palma - building materials, scientific equipment and even food items - were hand carried in visitors' luggage.

Nobody worked harder than Marilyn. She was inspirational. She was also someone who was impossible to turn down, and had no compunction in demanding the help needed. She even talked me into joining the board!

And then there was BINGO!

Bingo is hard work. A weekly event, it required at least 6 dedicated adult volunteers who would be on their feet for the entire day. Before the indoor smoking ban came into effect, indoor air quality was poor. The paperwork both before and after was onerous. Although the income was fantastic, it was not without some risk - licencing fees and fees to the venue had to be paid whether the event made money or not.

Even though bingo was very profitable, there were legal restrictions on how and where the money could be spent. Because of these restrictions, fundraising by other means had to continue.

Looking back on those days has certainly brought back some very pleasant memories of times and people. It was an honour to be a part of the early days of COTERC. Respectfully submitted. Lynn James



Notes From the Station by Charlotte Foale

It's hard to believe that we're already a quarter of the way through 2021, but here we are!

With turtle tracks spotted by the folks on the erosion survey in March, we are keeping a very close eye on the beach. Increased erosion in recent years has



Track of leatherback
Photo by Morgan Hughes

heavily impacted leatherback nesting as they need wide stretches of open sand well above the high-tide line. With declines in recent years, we

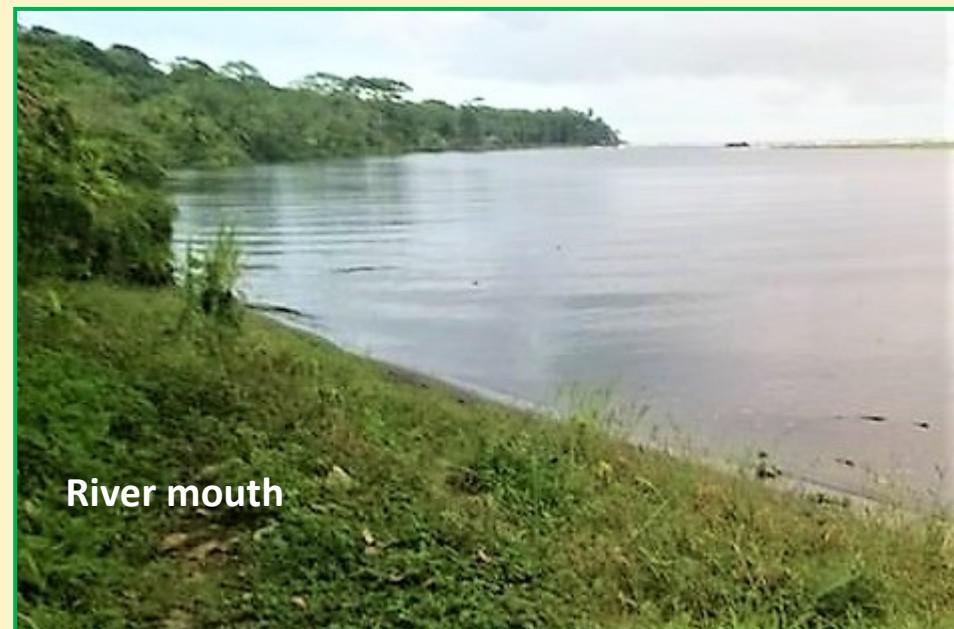
changed the season start date to May versus March in 2020. But for reasons that don't need repeating (!), those changes didn't come into full effect.

This year we hope to start night patrols in May, but we're monitoring both tracks and erosion in the mornings in order to give us an idea as to how to proceed next season.

For those who were here 8-10 years ago, the beach would be a bit of a shock. The river mouth, site of our marine-debris monitoring project just a few short years ago, has been underwater most of the time, for a little over a year. While this was an occasional feature

when I first arrived (a feature during flood months), this extent of erosion activity is unprecedented in Manuel's 22 years in the area.

While we're monitoring this through beach measurements, we also have an intern (the amazing **Theo Lepilleur**) looking at native plant species that may help to mitigate the extent of erosion. This could give us ideas on how to protect both the nesting habitat of other turtle species on the beach, such as the greens and hawksbills,



River mouth

as well as protecting properties close to the water's edge.

Theo is not the only amazing intern we have had join us. We also currently have **Thebao Huynh** from Germany, and **Gary Bourne** from the UK as well of course as the indispensable duo holding the reins, **Morgan and Sam!** (cont'd on next page)



Notes From the Station (cont'd)

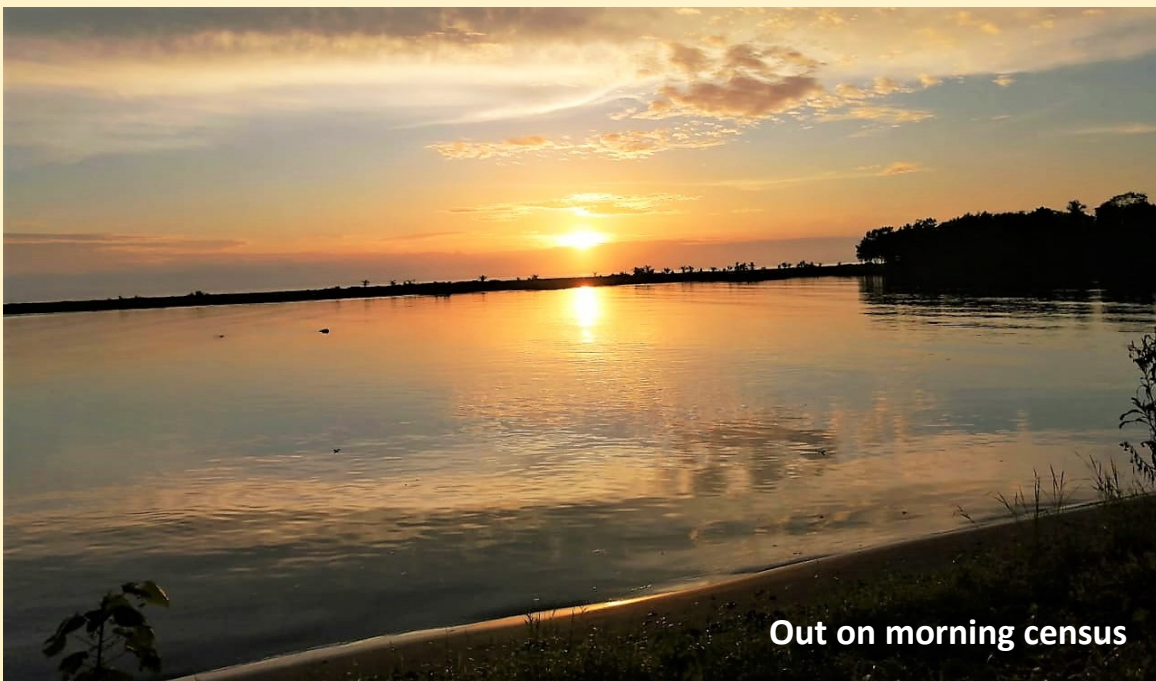
Ornithologist and Independent researcher **Greg Davies** has joined us from California, in his second visit to the area. After a scouting visit in 2019, he had to reschedule his 2020 research plans, but is now with us again, and looking at the mating behavior of the elusive sungrebes. We hope to have more on that for you in the next edition of *Raphia*.

We know that many of you are still in, or reentering lockdowns, but we have been pleased that some have been able to escape and join us. A massive thank you to **Henry, Malena, Odile, Elody** and **Lucas** for their time and help in recent months. Also a thank you to **Amy Cocksedge**, former intern trapped in Canada, who has dedicated a massive amount of time in helping to track down grants for us to apply for. Finally, but very importantly, thank you to **Abinash Subeskaran**, a 2020 virtual York Intern, whose fundraising efforts purchased a laptop for us to use in the community. The students of San Francisco, at both elementary and high school level, are making great use of it to do research for their homework and tests -- it's been an indispensable tool.

Things move forward slowly, but we couldn't move at all without the amazing contributions of our interns and volunteers. We hope that many more of you will be able to come down as we enter the turtle season proper – August and September are our busiest turtle months, and we're going to need as much help as we can get. For those who can't, we're always grateful for your continued support and interest.



Kids in San Francisco using new laptop



Out on morning census

Notes From the Chair

by Dr Kym Snarr



Happy 30th Anniversary!

What an incredible 30 years with so many challenges and successes for COTERC and for Caño Palma Biological Station. What tenacity Marilyn Cole, our founder, had to have in order to take her dream of a research station in a biodiversity hotspot and turn it into a reality. She had to set up networks of support and ongoing funding. While these sometimes had dead-ends or closed loops, a steady pathway was built up over the years. This led to: Long-term research in multiple taxa. Training of young scientists and citizen scientists both locally and internationally. Conservation and educational support for local populations. Plus partnerships with Costa Rica's Ministry of Environment and National Park System. As well, our partnerships with the Toronto Zoo, a multitude of educational institutions from Canada and across the globe, and all of our funders have allowed COTERC to support CPBS. Our positive impact has been felt locally, nationally and globally. We continue on in this positive work!

I want to congratulate those who have supported COTERC over the years as volunteers or as members. Many long-term Board people have always been there to help weather the storms. Countless station staff have moved into meaningful careers in conservation. Thank goodness for all of them! Currently, we have the steady hand of our station manager, Charlotte Foale, and our project leader, Manuel Arias, to sustain the building of our long-term research projects. What an important team these two have been!

Charlotte herself originated from the 'alumni'. We use this term to denote those who have been to Caño Palma and we feel all of you are a part of a larger team. We now rejoice in having on the Board ALUMNI who have been to the station. They have seen the hard work in action, and aided in our numerous research projects. They bring a clear, fresh vision to our ongoing work, helping with improving and analyzing and adding to our rich collection of data.

I myself am part of the 'alumni'. Reflecting back, I was introduced to the station in its first year of operation. I was at the station in its infancy with the first University group. Under the guidance of Dr. Frances Burton, we carried out some basic fieldwork on the three primate species that range there: the mantled howler, the black-handed spider monkey, and the white-faced capuchin. While the terrain was wet and tough, it helped me find a pathway into my career. Coming back into the fold via joining the Board in 2007, I continue the founding work of those who came before.



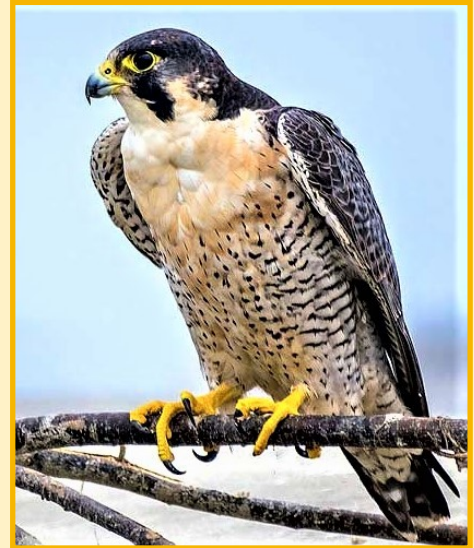
While the pandemic has perhaps been the biggest threat to our continued work by reducing the number of interns and volunteers at the station and thus reducing our ability to carry out our projects to their full extent, we persevere. Vaccination programs across the globe along with herd immunity will eventually contain the rise of new variants, and safer travel will ensue. Our path remains clear with COTERC/CPBS: continuing the hard work to support this incredibly rich biocultural region. We are calling on all alumni of COTERC and CPBS. Please contact us (chair@coterc.org) and let us know if you can contribute time or effort.

Migration of Peregrine Falcons Thru Caño Palma by Hernandez & Zook

This report was written at the very beginning of Caño Palma's existence as a research station. The authors, Daniel Hernandez and James Zook, describe a 79-K boat trip from the port of Moín (adjacent to Limón) to Caño Palma. It appeared in the Journal of Raptor Research. 27(2):123-125 1993

Several raptor species form immense concentrations during their annual northward and southward migrations through the Central American isthmus. The Peregrine Falcon occurs principally as a migrant. However, there are no reports of this species passing anywhere in Central America in large numbers. We present here observations of a concentrated spring flight of peregrines along Costa Rica's Caribbean coast.

During the 3-day observation period from May 1-3, 1992, we saw 83 Peregrine Falcons. On May 1, during the 79-km trip by boat from Moín to Caño Palma Biological Station, two peregrines were perched in trees along the canals. On May 2 at Caño Palma, 2 flew over in the morning, and then 59 passed over in the afternoon. On the morning of May 3, another 14 flew by the station. During the return boat trip to Moín in the afternoon, 5 were seen flying and one perched. Seven Merlins were also seen migrating during the 3 days. Thousands of swallows (mostly Barn Swallows), Chimney Swifts, and Lesser and Common Nighthawks passed overhead, also migrating up the coast.



During periods of low clouds or drizzle (as on the afternoon of 2 May),



the peregrines flew in direct flapping or gliding flight at altitudes of 30-100 m, the majority passing at less than 60 m. However, when sunny, they tended to soar higher, over 100 m, especially around Cerro Tortuguero, and took longer to pass. The flight line followed the coast with roughly equal numbers passing over forest, canal and beach. The peregrines came by individually or in pairs, although on several occasions up to 5 birds were in view at one time.

These observations were incidental to our main purpose, which was to band migratory passerines. No one was observing full time at Caño Palma until we realized the extent of peregrine migration. From 2 pm on May 2 to 11:15 am on May 3, one person was assigned to count peregrines. During both boat trips, three observers ran a census of all birds. From our point of observation, we had only a partial view of the sky. Several persons dedicated to looking for peregrines from a vantage point such as Cerro Tortuguero would certainly have obtained a better picture of the migration.

Whether or not the peregrine migration occurs there annually on this scale remains to be determined. For those interested in establishing monitoring sites for this alluring raptor, it is a question worth investigating.

Original article at link below. On that page, go to right side and click on "View article".

<https://www.biodiversitylibrary.org/part/227460>

Motherhood

This strawberry poison-dart frog was easily spotted as she crossed a sack on her way to depositing her tadpole in a nearby bromeliad.

She'll continue to visit, depositing an unfertilized egg to feed her offspring.

Thanks to Manuel Arias for following her to document the event.

-- CF --



Bats Go Bananas by Doug Durno

Someone asked if bats are the only animal to pollinate bananas.

Well, the whole pollination thing with bananas is a bit tricky. First of all, cultivated bananas, like the popular Cavendish that we eat, don't need to be pollinated because they're seedless, and thus sterile. They didn't start out that way. Scientists believe that farmers, to get a fruit that was fleshier and more edible, crossbred different strains of bananas to get one that no longer had hard seeds. What were once its seeds are the brown specks you see in the Cavendish's middle once you've bitten into it. Anyway, Cavendish bananas are all identical. They are clones. They have no genetic diversity. This makes them susceptible to being wiped out by a fungus just like their predecessor, the Gros Michel. In fact, that's already happening to the Cavendish in some places.

Then there are wild banana species that do need to be pollinated. In the growth process, female flowers develop first. They produce the fruit in the form of hands, which are covered by the purplish bracts (leaves), both furled and unfurled, you see in the photo at right. After the female flowers have fruited, male flowers appear and produce pollen. Bats, birds and bees spread it to other plants.

Bats mostly pollinate larger banana species that have droopy or horizontal flowers. Since most bats are nocturnal, the flowers open at night with a strong odor to attract the bats. Besides smell, some bats use echolocation, being able to pick out nectar-bearing flowers. They also have good spatial memory that enables them to relocate the plants.

Generally, birds pollinate the flowers of bananas that point above the horizontal.

Bees are obviously great pollinators of crops, and bananas are one of those crops.

Some consider bats to be the most evolutionarily advantageous pollinator for bananas and many other plants. That's because they can airlift and deposit larger amounts of pollen than bees and birds. As well, they disseminate it over a wider area. They do the same with seeds.

Unfortunately, bats, birds and bees spread something else besides pollen. They've been found responsible for being vectors of the deadly banana wilt disease.

Fast fact – The banana plant is not a tree. It's actually a herb – in fact, the largest of the herbaceous plants.

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<https://homeguides.sfgate.com/pollinating-bananas-46967.html>



Bat with pollen covering its face

White-Collar Workers Living at CP by Doug Durno



White-collared manakins are from a genus dubbed the bearded manakins. Males show their 'beards' when displaying.

Manakins are flashy birds from a flashy family. And we're lucky at Caño Palma to have two species that regularly appear in the garden. One is the red-capped manakin, which we'll save for the next issue.

This time round, let's check out the **white-collared manakin** (*Manacus candei*). As in most of the 54 manakin species, the male is vividly colored. As you can see in the pic, he has a lemon-yellow belly as well as the vivid contrast of his black crown and wings with a snow-white breast and upper back.

However, like many manakin species, it's the males' elaborate, often stunning, courtship rituals where they really strut their stuff. If you've been to the station, you may have seen, and heard, the white-collared manakin's display. If you haven't had

that opportunity, you'll want to watch these videos before we go any further. Note what a good housekeeper the male is, clearing a patch that becomes the lek (courting area).

[Male -White-collared Manakin - Cleaning the Dance Floor - YouTube](#)

[White-collared Manakin: Courtship dance and mating - YouTube](#)

In the video bits where he's darting around, I guess you could say that it's somewhat like watching table tennis. Something white is bouncing back and forth at high speed. Each bound is accompanied by what sounds like the paddle whacking the ball. Except the thwacking sound, like a firecracker, is the white-collared clapping his wings together over his back at a rate of about 57 times per second. That's fast - so fast that the human eye can't detect the movement.

Among vertebrates, that's one of the highest rates on record for a limb muscle to expand and contract. The muscle in question, the *scapulohumeralis caudalis*, is located at the shoulder joint where the wing attaches to the body. It plays a major role in flying too.

To enhance the clapping sound, the white-collared manakin has adaptations to the radius bone of the forewing. You can see in the picture that the radius is flattened and broadened, a surface shape that's better for producing percussive sounds. As well, the shaft of the radius is considerably solidified, unusual in birds where minimizing weight is important for flight.



Radius bone of the forewing

Researchers have proposed that the female white-collared manakin can precisely assess these roll snaps (as they're called). They found that she can discern differences of milliseconds in speed. So, the faster the male can clap his wings together, the more likely he is to be chosen by the female for mating. To paraphrase the researchers: intense activity such as the acrobatic display of the

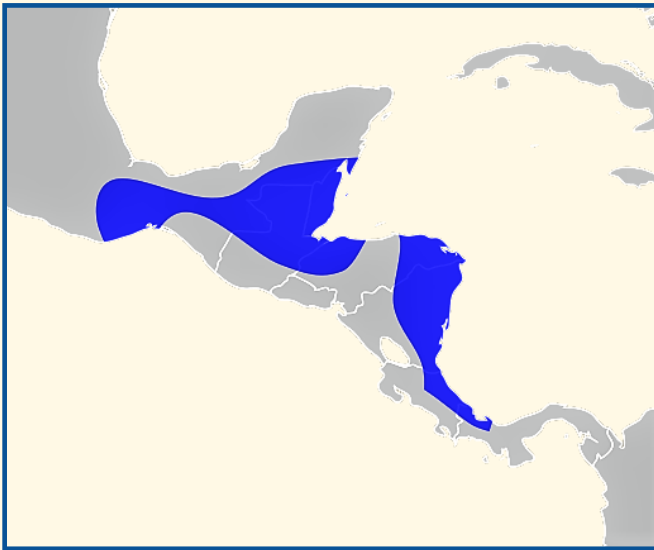
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White-Collar Workers Living at CP (cont'd)

white-collared manakin requires a considerable investment of energy, and indicates enhanced motor skills, coordination, power and cardiovascular function, and thus overall quality. And accordingly, good mating material.

Like other manakins, the white-collared is primarily a frugivore. But it doesn't generally perch to gather fruit. Instead, it maintains its reputation for being active by collecting fruit while in flight. At the station, you'll have a good chance of observing one flitting around the garden between food sources. It also takes insects for protein.

Note - The *Manacus* genus contains four species, called 'bearded manakins'. They get this name because they flare their throat feathers when displaying (as in photo of male on previous page) so that they project beyond the bill's tip. Besides the white-collared manakin, the others in the *Manacus* genus are the orange-collared, the golden-collared and the white-bearded



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Station Happenings

by **Morgan Hughes (Research coordinator)**

January

With more volunteers arriving, more surveys can be completed. However, to keep busy in the slower periods, we've been updating our databases to enable future researchers to better access and use the years of data that the station has. We met with experts in data management so that we could improve methods of data entry and backup across all our projects. As well, all data have been put into the same format.

In addition, after meeting with two experts in bat ecology, we've augmented our bat monitoring methods to include measurements of tent characteristics and condition. We've also found a more precise method for measuring snakes that has the added benefit of putting less stress on the snake.

We've also been updating and expanding all our training presentations in anticipation of the forthcoming arrivals of new interns.

February

With an increasing number of people at the station, more surveys are being done. That includes the resumption of information gathering on beach erosion.

Mammal Survey - Besides dogs, the most common mammal detected this month was the armadillo. Noteworthy sightings included jaguars and white-lipped peccaries at the station. On the Cerro, the **greater grison** was detected.



Tent-making bats - We've begun rating the integrity and quality of each tent on a weekly basis according to a predetermined scale. This allows us to make informed decisions on which tents to continue monitoring as well as reducing errors in the field.

Neotropical River Otter - Consistent with the change initiated last month, we're now recording only scat less than 24 hours old. Scat can persist in the environment for up to six weeks. The change was made because older scat, due to variations in water levels and degradation rates caused by local weather fluctuations, does not consistently indicate activity levels or site selection. As well, due to contamination, older samples are not suitable for DNA or microplastic studies. Fresh scat is also a more precise indicator of otter density. This month, we collected 8 scat samples for microplastic analysis and 16 samples for genetic analysis.

March

It's been a busy month. Administratively, we submitted all permits, and completed the final reports for hawksbill and green sea turtles for MINAE; finalized coordinations and advertisements for the bat workshop in November; completed data analysis for a macaw paper; developed/completed (cont'd on next page)



Station Happenings (cont'd)

two sessions of R workshops**; developed four projects with incoming interns; reviewed sea-turtle protocols, applied for an underwater drone; investigated grant options; and completed the environmental calendar and beach plant guide. In addition, we reached out to researchers at the Universidad Nacional de Costa Rica to discuss collaboration on an algae project; and to Osa Conservation to discuss methods' compatibility for projects with similar taxa. (** R is an open-source statistical package for data analytics and graphics)

Weather - Unexpected flooding led to the cancellation of some surveys late in the month.

Microplastic sampling in river - As part of Thebao Huynh's project, 5 surveys were conducted. Each subsample was taken by passing 25 liters of river water through a filter in order to collect suspended particles. Thebao will spend the next 3 months examining each filter under the microscope to document the variation in the microplastic density across different habitat types and in different locations.

ACER Forest Tree Monitoring - A total of 966 trees were measured across all plots.

Sea Turtles - For leatherbacks, 3 half-moons were seen and 2 nests were found. For greens, the numbers were 4 and 2. Unfortunately, all 4 nests are believed to be flooded because of the heavy rains.

Comment from Charlotte - We've had teams regularly monitoring the beach while out on erosion surveys, and we're happy to report that the leatherbacks are coming!

We've actually had both leatherback and green tracks as nesting activity starts. In past seasons, we've been in full swing by now, but Covid has reduced our personnel, and increasing levels of erosion in recent years has driven leatherbacks away in the early parts of the season. So we decided to start in the (hopefully) leatherback peak.

We hope you'll join us.

(cont'd on next page)



Theo Lepilleur and Thebao Huynh kayaking off to do microplastic sampling (Thanks to Sam Orpin for pic)



Leatherback track

Photo by Morgan Hughes

Station Happenings

(cont'd)

Jaguars - Stephanny Arroyo-Arce and Ian Thomson from Coastal Jaguar Conservation visited the station this month to search out jaguar scat. Accompanying them was their head searcher, Tigre, a Labrador retriever specially trained to find usually hard-to-locate cat scat. By comparing the genetics of scat found across a range of cat species, they'll evaluate the effectiveness of established wildlife corridors in maintaining genetic connectivity between populations. Ian and Stephanny also made three incredibly interesting and informative presentations to interns and staff.

Tigre and Stephanny

From her base at Coastal Jaguar Conservation not far from Tortuguero, Stephanny Arroyo-Arce is the coordinator of the Wild Cats Genetics Project, studying the genetic diversity of Costa Rica's six wild cat species. Tigre, a Labrador retriever, is Stephanny's research partner, specially trained to sniff out the scats of all six: the jaguar, puma, jaguarundi, ocelot, margay and oncilla. Finding scat can be like looking for a needle in a haystack. But to Tigre, finding it is not a job, it's his favorite game of hide-and-seek.

Scats are a wealth of information, helping Stephanny learn what the cats eat, their over-

all health, and details about their genetic background. They're so useful that they've helped her and her team produce the most complete genetic survey of jaguars in Mesoamerica.

Doing much of its work in Tortuguero National Park, Coastal Jaguar Conservation has learned a lot about the social behavior of the jaguar. Such studies enable SINAC (the administrator of Costa Rica's national parks) to make more informed decisions that will help guarantee the long-term survival of the jaguar in our area.

Tigre and Stephanny searching for scat in the forest.



Costa Rica Jumps the Charts by Doug Durno

The United Nations has long published what they call the "Human Development Index" (HDI), which attempts to rank 190 countries based on per capita income, life expectancy, and access to health and education. Not surprisingly, the high scorers are countries with strong economies and stable government. Though Costa Rica is ranked in the top tier (called "very high human development"), it's long hung around the 60th to 70th spot.

But the UN thought they'd try an experiment. They took the latest rankings from 2019 and added environmental criteria - what they call "planetary pressures". Costa Rica soared up the rankings, going from 62nd all the way up to 25th. That's the highest placement of any Latin American country and the biggest increase of all countries.

Planetary pressures are meant to show how well a country protects its environment. They're based on per-capita CO₂ emissions and a country's material footprint. The latter measures the total resources (or raw materials) used in a country's production chains. That would be resources such as fossil fuels, biomass, metal ores, and non-metal ores like stone, sand and asphalt. In other words, they're measuring how much pressure a country puts on the resources of the planet.

According to Jose Vicente Troya-Rodriguez of the UN, this adjusted index demonstrates that Costa Rica is showing the world that it's possible to increase human development in a sustainable way for the planet's health.



Costa Rica laid the groundwork many years ago by deliberately increasing its

forest cover, which now extends over 52% of the country. That offsets a lot of CO₂ emissions.

Costa Rica is also moving toward a green economy by generating 98% of its electricity through renewable sources that are free of the emissions that contribute to global warming. Such decarbonizing is a big part of its plan to eliminate the use of fossil fuels by 2050.

Still, Costa Rica has room to move up in the Index. Troya points out problem areas. For instance, the country must work on improving education, and producing more prosperity by reducing poverty. Gender inequality is an issue as well - 76% of men are in the workforce compared to only 48% of women. And men's incomes are almost twice as high as women's.

(cont'd on next page)

Costa Rica Jumps the Charts (cont'd)

As well, Costa Rica's excessive use of agrochemicals will have to be dealt with. This problem was illustrated in the last issue of *Raphia* (Winter 2021) and its feature on Paul Grant's research on pesticide runoff from banana plantations.

But how did the more prosperous countries do on the adjusted HDI? Well, the US sank 45 spots, Canada 40 and Australia 72. They demonstrate that most developed countries have been putting a lot of pressure on the planet's resources to secure prosperity.

Generally though, European countries fared well though the adjustment factor for planetary pressures did lower their scores. Their scores just didn't decrease as much as most other countries so they mostly moved up in the rankings.

Still, when Costa Rica's neighbors - Nicaragua, Honduras and Guatemala - had almost perfect scores on the adjustment factor, this new measurement is likely not perfect. You might say that it's great that those countries weren't exploiting resources. But it might also mean these countries weren't doing much to better the welfare of their citizens - which is why they all place in the bottom third of the HDI. My personal experience in those countries didn't see people treating the environment at all well.

References

<http://hdr.undp.org/sites/default/files/hdr2020.pdf> - You'll find the rankings on Page 241

<https://ticotimes.net/2021/01/14/environmental-efforts-send-costa-rica-to-top-of-human-development-index-in-latin-america>

As if to highlight Costa Rica's environmentalism, the quote below appeared in *National Geographic Traveler* magazine on January 29th in a list of "destinations to visit in 2021". Costa Rica was highlighted as an example of sustainable tourism, which NG relates to caring for the environment, and so caring for the planet.

"So you want to escape? Imagine a country with a quarter of its territory with national parks, a place where you can walk through the rainforest in the morning and surf in the afternoon. Imagine an Eden of adventure where sustainability was a strategy long before the world caught up, where jaguars roam the jungle, towering birds soar through the sky, and lizards walk on water before your eyes."

Chart at right shows shifts in the rankings for selected countries when the HDI is adjusted to take into account 'planetary pressures'. Numbers in parentheses indicate each country's ranking on the standard HDI. So, the chart shows that Canada, for instance, is in 16th spot, but drops to 56th (16+40) when the rankings are adjusted for planetary pressures.

Norway (1)	- 15	16
Ireland (2)	+ 1	1
Switzerland (2)	--	2
Germany (6)	- 1	7
Australia (8)	- 72	80
Netherlands (8)	- 6	14
UK (13)	+ 10	3
New Zealand (14)	+ 6	8
Canada (16)	- 40	56
USA (17)	- 45	62
Japan (19)	+ 2	17
Spain (25)	+ 11	14
France (26)	+ 16	10
Italy (29)	+ 12	17
Russia (52)	- 4	56
Panama (57)	+ 30	27
Costa Rica (62)	+ 37	25
China (85)	- 16	101
Guatemala (127)	+ 10	117
Nicaragua (128)	+ 9	119
Honduras (132)	+ 6	126

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