



The Amazing Moonwalker of Caño Palma (Page 6)

Canadian Organization for Tropical Education & Rainforest Conservation



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Saving the Tropics One Person at a Time

A bird that moonwalks and slaps its wings to attract the opposite sex. Monkeys with mysterious behaviors like eye poking. Trees that conceal ants. They're all part of the appeal of Caño Palma - and discussed in this issue

It is wondrous. And all these things and so much more are there waiting to be discovered by anyone who has the determination to track down these wonders of nature in our jungle sanctuary.

And that's part of our mission with local kids. They already have so much life experience gained from living in the tropics. By working with them, maybe some will find that spark of curiosity to investigate further and bring their experience to future studies. At the very least, we can pass on the importance of conservation so that all these wonders of nature will still be there for generations to come.

So, to people like Morgan Hughes (on Page 4) and those who preceded her in organizing Conservation Club and other similar endeavors, we give a massive shout-out.

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

ISSN 2564-5927 (Online)

ISSN 1188-2425 (Print)

Annual General Meeting



Canadian Organization for Tropical Education and Rainforest Conservation

Box 335, Pickering, Ontario, Canada L1V 2R6 info@coterc.org/www.coterc.com

Take Notice: COTERC's Annual General Meeting (AGM) will be held virtually using 'ZOOM' on:

THURSDAY, MAY 12th, 2022
AT
7:00 P.M. (Eastern Time Zone)

Participants are required to contact Dr. Snarr at - chair@coterc.org
No later than May 1st, 2022, to obtain registration details.

An election for the following Board of Directors positions will occur. Term positions are for two years unless otherwise indicated. Kindly submit your CV to Dr. Snarr at - chair@coterc.org no later than May 1st, 2022, indicating the position of interest.

- Finance
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Working With Local Kids on Conservation -- Part 2 by Morgan Hughes

Morgan was the Research Coordinator at Caño Palma from December 2020 to December 2021. In the Winter 2022 issue of *Raphia*, she outlined the value of teaching conservation to local residents. In this issue, Morgan outlines some of the details of her lesson plans.



In the Winter issue, I described how and why we set up a Conservation Club for local kids. We met once a week and for the first 5 weeks we concentrated on bats.

Round 1 - Bats

Week 1 - Anatomy and taxonomy or "what do I look like and who am I related to".

Week 2 - Flight and echolocation - As this lesson had some pretty technical themes, I was worried about how it would go but was very happy with the result. We started off with a review game where the kids form a circle, throw the ball to the music, and answer a question if they have the ball when the music stops. We then moved to the library for a PowerPoint presentation. We started with the four forces of flight: lift, gravity, thrust and drag. We talked about how bats are adapted to maximize lift and minimize drag. To introduce the concepts of dynamic vs. static flight, I showed them slow-motion videos of hovering pollinators and gliding vultures. We talked about how different wing shapes are adapted to different types of flight so a bat species that lives in open areas can't fly in the dense forest and vice versa. We tied this in with conservation and the need for intact habitats. We then built paper airplanes to see which wing shapes flew the farthest.

After a break, we talked about all the ways that bats are adapted to echolocate. We played a "guess the distance" game. The students formed pairs with one acting as a sound wave by running to one of four set points and returning. His partner had to guess how far they went. Next, a blindfolded student is spun in a circle and has to find the wall by clicking. Finally, students had to match the echolocation type with a wing shape and a habitat type. We closed the day with a brief walk in the forest around the station.

Week 3 - Sociality

Week 4 - Diet and roosts

Week 5 - Conservations and rabies

Round 2 - Community Resource Management

Because this program was with older kids, I dreamed big, building each lesson on the previous one.

Week 1 - We presented **r vs k life history strategies** and each kid had to go through a series of challenges as either a macaw (k strategy) or a caiman (r strategy).

Week 2 - We applied these life-history strategies to differences in population

(cont'd on next page)

Working With Local Kids on Conservation (cont'd)

growth and the density of the population.

Week 3 - We applied population growth to how we might figure out a sustainable harvest for a species. We followed by outlining 'the tragedy of the commons'.

Week 4 - A field trip to Tortuguero National Park.

Week 5 - We focused on our turtle project and had students practice tagging on our cardboard turtles as well as building anti-predation mesh.

In following weeks, we used games that made them think about the sustainability of populations. For example, they played the fish-pond game where they quickly wiped out the population because each acted independently according to their own self-interest contrary to the common good (tragedy of the commons).

We discussed the current state of the global fisheries (spoiler alert... things aren't great) as well as reading about how fisheries are managed (e.g., catch limits, seasons, minimum size). They then worked to establish rules for their fisheries. They created fish farms, protected areas and minimum size limits for fish. This ended with a successfully managed fishery.

Now it's up to the students to try to apply what they've learned to their everyday lives.



R vs K Life History Strategies

R-selected species live in populations that are highly variable. The fittest individuals in these environments have many offspring and reproduce early. For example, oysters produce 500 million fertilized eggs a year and provide no parental care.

K-selected species live in populations that are at or near equilibrium conditions for long periods of time. For example, the great apes produce one infant every 5 or 6 years and provide extensive parental care. Competition for limited resources is very important in their environments.

Life-history theory may be useful in helping determine why k-selected species tend to be at greater risk of extinction:

- They tend to be bigger so they need a larger habitat to live in.
- They tend to have fewer offspring so that their populations can't recover as fast from a disturbance such as overhunting or fire.
- They breed at a later age so that their generation time to grow from a small population to a larger population is long.
- Their population size is often small so that they run a high risk of inbreeding.

Dancing & Clapping

The Curious Behaviors of the Red-Capped Manakin by Doug Durno

In Australia, I was told that the emu appears on their coat of arms because it can only move forwards, signifying that Australia is always advancing and progressing. I found that explanation strange since all birds can only move forwards.



Except Caño Palma hosts the world's only bird that can move backwards -- the red-capped manikin (*Pipra mentalis*). In fact, the male's dance is likened to the moonwalk. The females are eager onlookers. After all, the male's moves are done to attract them.

The male flies between two perches, landing with an explosion of sound, not from his mouth, but from his wings (more on that later). Then he slides backwards along the branch, doing quick, short hops so that he appears to be gliding. He keeps his head down and his tail up as he backs toward his intended mate, ending in a position that humans would find repugnant if done to them - his rear end is basically in the female's face. This video demonstrates it all:

<https://www.youtube.com/watch?v=x6FISaTkzB8>

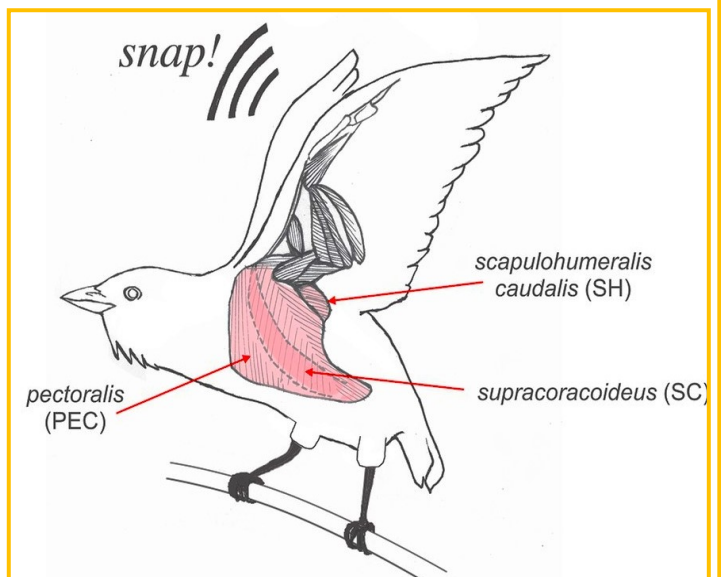
The whole scene is sort of like clubbing except in the bird world it's called lekking. The lek is the dance floor and a group of males takes turns performing their dance in front of a female in hopes they'll be impressive enough to be her chosen one.

Now let's return to the sound the male makes with his wings. The wings' secondary feathers have evolved to be large and rigid. He lifts them above his body and rapidly brings them down so that they whack against his thighs and tail. When this movement is done multi-

ple times in quick succession, it produces a clapping sound that appears to be exploding from his body as in the latter half of this video.

Chapter 11: How it Evolved: the Red-capped Manakin - Bing video

The clap is apparently a sexually selected behavior. The male's superfast contractions are a hit with the ladies, exhibiting his fitness. Indeed, the movement is produced by one of the fastest-known limb muscles in a vertebrate, the *scapulohumeralis caudalis*. Contracting at about 85 cycles per second, that's almost as fast as the fastest wing beats (cont'd on next page)



The Red-Capped Manakin (cont'd)

measured in hummingbirds. It's twice the speed needed for red-capped manakins to fly.

The wings pulsate so rapidly that the movement is undetectable to the human eye. It's produced by a unique evolutionary design of the wing muscles that allows these superfast movements for displaying while at the same time allowing two other wing muscles to deliver enough force so that the manakin can fly.

It should also be noted that the red-capped's wing bones, being solid in contrast to the hollow bones of other birds, "have evolved far from the natural selection for flight efficiency".

The red-capped manakin also has an unusually fast digestive system. Since it feeds on fruits that are high in water content but low in nutrients, that means it has to consume a heckuva lot of fruit each day. In fact, it takes just 18 minutes from intake to excretion. Seeds that are indigestible are regurgitated, which makes the red-capped a good disseminator of seeds.

So, if you want to see the red-capped manakin, you've come to the right place. It's a bird of tropical lowlands, preferring humid forest, forest edges and clearings. Fruiting trees around Caño Palma are a good place to look for it.

References (click to open)

Select forelimb muscles have evolved superfast contractile speed to support acrobatic social displays | eLife (elifesciences.org)

This Bird's Superfast Wing Muscle Is For Mating, Not Flying | IFLScience

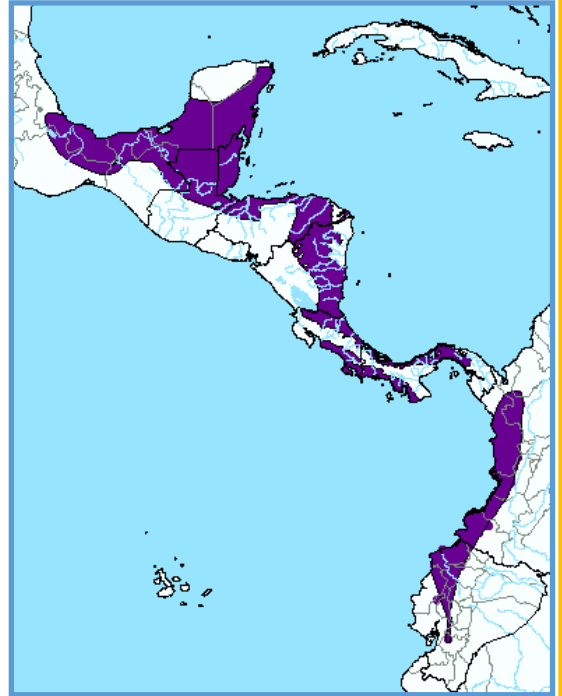
Tropical birds develop 'superfast' wing muscles for mating, not flying (phys.org)

High-speed video analysis of wing-snapping in two manakin clades (Pipridae: Aves) | Journal of Experimental Biology | The Company of Biologists

Further Videos

Red-capped Manakin on Vimeo

Red-capped Manakin, Moonwalk dance, Costa Rica - Bing video



Monitoring Caño Palma's Tropical Forest by Art Shannon

In January 2022, Dr. Kym Snarr and myself returned to Caño Palma. Kym, as she is the Chair of COTERC, was there to continue to help advance various projects at the station. For myself, I went down to further the long-term monitoring project, Forest Plot Monitoring, which I had been involved with in 2020. Since then, I was asked to bring my expertise in forestry to help bring consistency to this project. Kym and I have and will continue to visit the station on a regular basis.

I have been excited to be involved in this worthwhile project that advances the understanding of how tropical forests grow and how the diversity in different ecozones influenced by global climate change is affecting them. This project is an extension of the work I had done my whole career, except that work was done in temperate forests in Ontario. I have always championed good forest management.

Working within tropical rainforests, and especially working with Manuel Arias, puts a whole new spin on being in the forest. Manuel has an almost magical sense of tropic forests and the fauna that lives within them.

For this project, there are two plots being examined: one at the station and one across the canal at the Cerro. Making some modifications for practicality along with donating forestry equipment, I have welcomed the gained perspective in the differences between the temperate and tropical forests.

This work is not without hazards as witnessed by every person working on this project. The main hazard is ant bites as you have to embrace trees to determine the diameter at breast height, leaving you susceptible to being bitten by the ants that are on almost every tree. As anyone who has been to the station can appreciate, your full attention is required when working the trees in order to avoid more serious injuries such as snake bites or twisted ankles when working the steep, slippery slopes of the Cerro. Even given these hazards, it is so worth it to experience this brilliant ecosystem up close and personal within the rainforest. I will continue to volunteer each year to help drive this project forward, contributing my time and equipment as needed. What a wonderful way to take my life skills and expand them to help train young scientists while bringing important data to light on tropical forests.



Dr Kym Snarr & Art Shannon



Art measuring girth of tree

(cont'd on next page)

Monitoring Caño Palma's Tropical Forest (cont'd)



Kym & Research Coordinator Lianne Woudstra - with Manuel up tree measuring



Sebastian Martinez



Art Shannon

The Forest Plot Monitoring project, aka the ACER project, monitors the health of the forest. This is a long-term project that tracks changes in forest diversity over time. It has been a project run by students from Vanier College in Montreal doing internships. As one intern put it, "In the long run, we'll know such things as the abundance and mix of the various tree species. As well, we'll know the species richness – the more species there are, the better it is for the health of the forest."

Notes from the Station by Charlotte Foale

While I've mentioned the infrastructure improvements that your donations have helped us complete at the station, that's not the only area in which we've made much-needed progress. Thanks to an incredibly generous gift from the Griggs Family Foundation, we've been able to take a big step forward in our community-conservation work.



Trash Accumulation

Their donation is helping to cover stipends for the turtle and community work, and that meant that in March we were able to welcome back Sebastian Martinez. Sebastian helped lead on the beach last year, and, in his first weeks here now, he has assisted us in launching a much-needed recycling initiative in San Francisco, the village neighboring the station. The status of rubbish removal there has changed considerably over the past 15 years. With many residents struggling to transport rubbish to Tortuguero, San Francisco established a recycling center that ran for just a couple of years before closing. This was replaced by a general pick-up when the trash-boat has room after loading up in Tortuguero once a fortnight. This can mean that we go for a month or two without rubbish removal, and that excess waste is just left at the main San Francisco dock for dogs to rummage through for two more weeks. It's unsanitary and unsightly, and has driven many residents to burning their household waste.



Trash has to be hauled away by boat

At the end of March, we initiated a recycling program in the San Francisco school, and students are now competing to see who can bring in the most clean, recyclable material. There are points awarded to the classes who participated, based on the volume of the containers they bring in. As aluminium is more recyclable than plastics, more points are awarded for can recycling, and we'll be selling the cans at recycling centers to raise money for the school. All of this is tied in with education about the impacts of the waste that we produce on the environment we depend on.



Sorting recyclables

In the meantime, the community association is working towards a new recycling center, which will hopefully have greater success as the younger community members will have developed some great habits. It's been fantastic to see the enthusiasm of the students, and in just the first couple of weeks, they brought in over 60kg of recyclable plastics, and close to 800 cans. This has had the immediate impact of the trash-boat being able to remove all of the residual, non-recyclable waste for the first time in well over a year. While this isn't particularly glamorous (!), it's a massive improvement.

I want to thank Sebastian for his weekly collection efforts, as well as the amazing volunteers and interns who are helping with the considerable task of counting and sorting, and of course, the Griggs Family Foundation for the financial support that has enabled us to move this project forward.

Congratulations to Dr Emily Khazan

Dr Khazan recently received her PhD from the University of Florida. Below she summarizes her dissertation. Following the summary is the dissertation's abstract. Emily is the Director of Research and Conservation on the Coterc Board.

In general, I studied many ecological questions in the context of entire butterfly communities in the Colombian Andes. I explored differences between butterfly communities across elevations and land use types, both with respect to which species are where and with respect to species traits. Specifically, I studied which factors, environmental or species-specific, are most influential in butterfly thermoregulation. I found that, regardless of where butterflies came from (elevation/land-use type), the most important factor in thermoregulation is the interaction between ambient light and wing darkness. In addition to community ecology and thermal physiology, with collaborators I explored the microbiome of two species of *Heliconius* butterflies. These findings further the knowledge of microbiome structure in butterflies and broadens our understanding of this charismatic genus.

Finally, my dissertation includes a chapter about TA evaluations for which I deceived an online class, telling half that I was a female TA and the other half that I was a male TA. At the end of the semester, the "male" TA received higher student evaluations than the "female" TA despite both being me! Hopefully this chapter highlights that there exists early career bias with respect to gender that can have cascading effects for female educators and researchers in STEM.

Abstract

Tropical regions, famous for their immense diversity of species, are areas of great concern for conservationists due to the continuing negative impacts of development and climate change. Butterflies (Insecta: Lepidoptera) are found globally and are highlighted as one of the many hyper-diverse insect groups in the tropics with key roles in ecosystem processes and services as adults and larvae. Butterflies rely on their surrounding habitat, including the ambient light and temperature environment, to thermoregulate -- a physiological requirement mediated by morphology and behavior. As forests are cleared for agriculture and other development, and as temperature extremes become more intense due to climate change, thermoregulation of butterflies (and other ectotherms) becomes increasingly challenging. Environmental changes, both fast (e.g., deforestation) and gradual (e.g., climate change) impact butterfly communities by changing composition and availability of host plants and the structure of forests which alters the thermal signature/light environment, changing the habitability of a region.

This dissertation explores the variable communities of butterflies in native forest and active pasture in the Colombian Andes. In it, I test the mechanisms by which butterflies across these habitats thermoregulate (i.e., recover from a cold shock) and parse apart drivers of physiological patterns from the individual to community scale. I used data generated from a new method of physiology assay, one that is accessible to scientists at any level and in any place, also described in this dissertation. Results from these assays show that at the community scale, across elevations and land use types, cold shock recovery in butterflies is best explained by thermal melanism (i.e., the interaction between wing darkness and ambient light) as opposed to solely species traits, native habitat, or elevation. In this dissertation I also explore the internal microbiome of two species of *Heliconius* butterflies, testing for patterns geographically and taxonomically. While we documented bacterial groups not previously found in *Heliconius* microbiomes, we found no taxonomic nor geographic pattern in microbial community structure. Finally, one chapter pulls on the ubiquitous graduate experience of working as a teaching assistant (TA) and demonstrates the persistence of bias based on gender in student evaluations of TAs.

White-faced Capuchins -- Part 2

by Doug Durno

Let's continue our look at white-faced capuchins that began in the Winter issue of *Raphia*.

The alpha male fathers about half the young in his troop. Since dominant males tend to maintain their position for quite a while, often over 10 years, many of the females that reach breeding age (6 or 7 years old) are their daughters. Though the reason hasn't yet been pinned down, father-daughter inbreeding is mostly avoided, unusual for a New World primate. One study found that the alpha male fathered about 80% of the young produced by females that were not his daughters. On the other hand, he fathered only about 6% of the babies produced by his daughters.

Let's move one step further. Do young males mate with their sisters? The most common way that social animals avoid breeding with relatives is for either the young males or females to migrate to another troop. For white-faced capuchins, the males leave while females stay with their birth troop all their life.

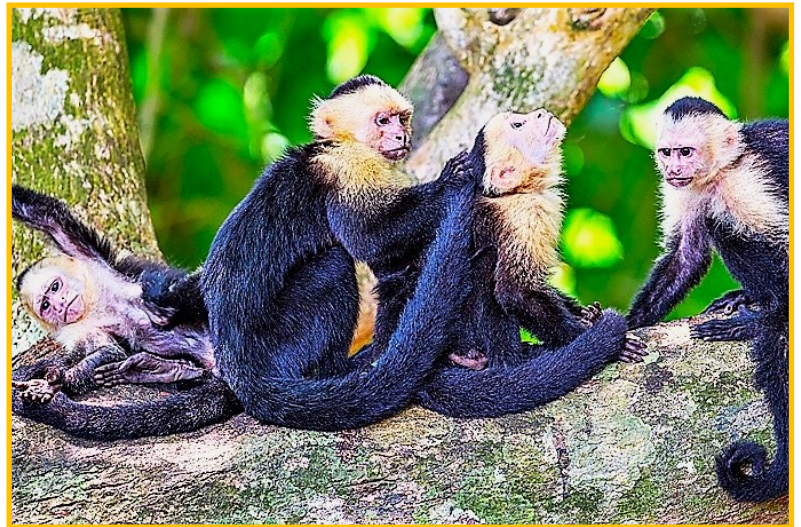
Starting at four, the males might migrate many times. Migration is a risky time because the male will probably run into another troop that could possibly attack him. The males in that troop are wary of outsiders. They see any migrating male as a threat to their breeding dominance. And the females realize that, if migrators do manage to take over, it's a good possibility that they'll kill any young in order that the females are put in mating mode straight off. So migrating males, to counter this threat, usually travel as a group.

Though mating may take place at any time, conception almost always occurs between January and April when females reach their peak fertility. Usually they give birth to a single baby. An infant rides its mother's back for about six weeks and starts moving about independently at around three months. Other members of the troop will assist with parenting young



who are not their own (alloparenting). Females can have their first offspring at seven years old, and further young appear at two-year intervals.

Within troops, which average about 16 members (three-quarters female), white-faced capuchins are highly social. They spend a lot of time strengthening bonds. Females mainly do this through grooming.



However, troops engage in a few strange bonding behaviors including hair-prying, tail-sucking and finger-biting. But things can get even stranger. Take eye-poking. One capuchin sticks a finger between the eyelid and the eyeball of another capuchin and holds it there for several minutes. They do this despite the danger of infection or eye loss (cont'd on next page)

White-faced Capuchins -- Part 2 (cont'd)



due to unsanitary and sharp fingers. Meanwhile, the recipient may reciprocate by sticking a finger in the other's ear or mouth. Then there's hand-sniffing, another odd bonding strategy. One monkey inserts a finger in another's nose and, with a trance-like expression, keeps it there for a few minutes. The recipient then reciprocates. Strange ways indeed.

Some researchers believe these behaviors are not just about bonding, but, they suggest, the white-faceds are actually testing those bonds.

"The idea behind this hypothesis is that some animals will impose a stressor on another one in order to gauge its reaction - to get kind of an honest response of how you feel about somebody....This bond-testing can provide information about others' reactions and tolerance for discomfort. This can be useful in guiding future social behaviour - and developing allies."



For a small mammal, capuchins are fairly long

-lived. Some live into their late 20's in the wild and past 50 in captivity. Recent research on white-faced capuchins has identified genes that help repair damage to their DNA. Since such damage is likely a major contributor to aging, these genes probably contribute to the white-faced's longevity.

Since white-faced capuchins are arboreal, deforestation is the main cause of premature death. In fact, it's led to them being classified as Endangered in Central America and Vulnerable in their South American range.

Another leading cause of early death is infection, often from injuries sustained in fights with other troops. They're also in danger from predators like snakes, cats such as ocelots and jaguars, and large raptors such as harpy eagles. The troop is quite vigilant though, and alarms are sounded when a predator is spotted.

A positive role that white-faced capuchins play relates to all the varieties of fruit they eat. Since they move about quite a bit in search of food, they're constantly spreading seeds over a large territory.

References

<https://www.pnas.org/content/118/7/e2010632118>

ADW: *Cebus capucinus*: INFORMATION (animaldiversity.org)

https://en.wikipedia.org/wiki/Panamanian_white-faced_capuchin

The Impact of Research-Based Tourism on the Tortuguero Area -- Part 1 by Laurentian University students

This is an edited version of a paper produced by students of Laurentian University in Sudbury, Ontario. Participants were Carole Anderson, Gregory Robillard, Alexandra Stankiewicz, Katrina Tisdale and Mitch Harrow. Project Head was Dr. Snarr, Chair of the COTERC Board. Part 2 will appear in the Summer 2022 issue. Page numbers indicate where each particular section can be found in the original paper available at http://www.coterc.org/uploads/1/6/1/8/16182092/research_based_tourism_2016_snarr_laurentian_university_class_report_1.pdf

A growing number of travelers to Costa Rica are moving beyond ecotourism. They're seeking even more environmentally friendly ways to visit and positively impact developing regions. This more enlightened way of travel involves ventures such as **volunteerism** and **research-based tourism**.

Tourism surpassed the banana trade in 1992 to become Costa Rica's primary source of foreign exchange, forcing locals to rely heavily on it. This increasing interaction can cause a conflict when foreign cultures influence a host country's culture, economy and environment.

Our study, focusing on research-based tourism, will assess those conflicts as well as the potentials of the growing ecotourism sector in the Tortuguero area, specifically as they apply to visitors to Caño Palma Biological Station (CPBS).

Interviews were used to gain understanding of the visitors:

- a) Their various reasons for participating at the station.
- b) Their contribution to the economy of the San Francisco area.
- c) Their cultural expectations of the station.
- d) Their feelings about their environmental footprint during their stay at CPBS.

Economic Impacts (Page 8)

As volunteer tourism increases, the tourism industry is moving away from a model that emphasized experiencing a new culture towards one that emphasizes local participation and conservation education. The latter hopefully provides more economic and ecological sustainability.

Why do volunteers come to the station?

Though some felt the cost of staying at the station was pricey, others pointed out that other programs they'd participated in were more expensive. CPBS offers many research-based experiences including the opportunity to patrol the beach monitoring sea turtles and their nests as well as participating in data collection of local mammals (including bats), caimans and lizards. As a result, volunteers have furthered the conservation of sea turtles, participated in biological fieldwork, and expanded their knowledge of marine biology.

Contribution to the local economy

CBPS is committed to remaining local. As the station manager said: "We buy anything we can locally - fruits and vegetables, dry goods, construction materials....When we first came to the station, it was all about local, local, local, but we just can't anymore....We have broadened our definition of local. (cont'd on next page)

Impact of Research-Based Tourism

(cont'd)

Everything at the station is only from Costa Rica... [Because of our 'buy local' policy], a lot of people I know are better off economically. They have better houses and a better way of living."

Social and cultural impacts (Page 11)

Visitors to Caño Palma have had limited contacts with adults in San Francisco. Generally, the interactions that did take place were positive. The visitors described the people as friendly, fair, and in some cases generous.

On the other hand, comments about interaction with village children were mixed. Some visitors were shocked at the lack of discipline and structure in their lives. Many surmised that their behaviors were due to a lack of structure at home. One described the kids as more macho and rougher than back in Canada. Another said that the kids didn't listen when being helped with homework. Another said that, since they expect visitors to soon leave, they give little respect to those who are helping. Yet one long-term community intern said that eventually they came to accept her, and she felt she had become a role model for kids who weren't getting much direc-



tion from their parents. With an average stay of 12 weeks, the quality of interactions between visitors and locals had time to improve.

According to a manager, station personnel have had a positive impact as residents become increasingly aware of what's happening around their community. For instance, photos taken of poached nests and murdered turtles were posted around San Francisco. Soon all the stores wanted a poster to display. As well, people are phoning the station to come and remove snakes. Before they would just kill them. Children are learning that snakes aren't harmful.

Visitors generally realized that their participation in the station's programs had a big impact. This is important as it shows a true understanding of Caño Palma's purpose. They saw the importance of data collection. In this way, they're differentiating themselves from tourists. Research-based tourists and volunteer tourists are those who can recognize the importance of their role, and express a desire to inform the general public with their findings.

Part 2 will appear in the next issue.

Station Happenings by Lianne Woudstra, Research Coordinator

March With a good number of people arriving at the station, we were able to get survey frequency almost back to normal.

Sea turtles - March got the turtle season rolling though turtle numbers were still small. Morning census has marked out 10 leatherback nests plus 1 green.

Tent-making bats - On the five surveys, we checked 266 tents. We observe the condition of the tents, the presence of bats, and signs of foraging and feces. This month 71 bats were observed.

Of those 71, 14 were what we used to call in earlier surveys *Uroderma bilobatum*, the common tent-making bat. However, I've found out that this species can't visually be distinguished from *Vampyriscus nymphaea*, the striped yellow-eared bat, without handling the bat. For this reason, observations of this bat will be noted in the future as *Uroderma bilobatum/Vampyriscus nymphaea* in our reports.



Uroderma bilobatum
(common tent-making bat)



Vampyriscus Nymphaea
(striped yellow-eared bat)

Birds & Bees & Coffee -- A Win for Biodiversity

by Doug Durno

Let me tell you about the birds and the bees and coffee plants. A new study in Costa Rica found that this trio works synergistically to produce coffee beans that are larger and more abundant than if the plants were just left alone.

Considering birds first, species like the yellow warbler and rufous-capped warbler protect the coffee plants by consuming insects. According to studies, insectivorous birds gobble up about 50% of the small beetles called coffee berry borers (*Hypothenemus hampei*) that are the coffee plants' worst enemies. Borers cause more than US\$500 million in losses annually.

As far as bees, though *arabica*, the world's major coffee plant, is self-pollinating, this recent research shows they benefit from bees cross-pollinating them since more flowers fruit, increasing yield.

Without the pest control of birds and the pollination services of bees, it's estimated that crop yields would be reduced by one quarter, which would shrink farmers' incomes by US\$1066 per hectare.

The research, conducted on 30 Costa Rican coffee farms, experimented with four scenarios: "1) birds only for pest control; 2) bees only for pollination; 3) the control, where both birds and bees were present, free to protect and pollinate as they pleased, and 4) neither activity, where birds and bees were excluded."

After establishing the benefits of having birds and bees around, the researchers are trying to pass their findings on to Costa Rican farmers to spur them to implement practices that encourage biodiversity in their fields.

This would mean that farmers establish and conserve habitats the birds and bees require. As well, they should reduce the use of chemicals and leave weeds alone, giving the bees a place to forage and nest year-round. For birds, farmers could plant fruit trees to

provide them with shade and resources.

Governments can also play a role by encouraging forest restoration as is done in Costa Rica.

What can you do?

First, buy beans grown on farms that manage their land to produce sustainable coffee. Second, encourage the protection of those birds who migrate from your backyard down to Central America.



References

<https://www.pnas.org/doi/full/10.1073/pnas.2119959119>

<https://nationalpost.com/life/food/why-even-self-pollinating-coffee-needs-the-birds-and-the-bees-for-better-beans>

The Coffee Berry Borer Beetle

Not many pests, if any at all, cause as much damage to a crop as the coffee berry borer beetle does to the coffee plant.

Ironically, caffeine is a natural deterrent to pests as it's bitter tasting and toxic. Yet the coffee borer beetle thrives on coffee beans, the only insect that can survive solely by eating them. "The beetles are able to consume the equivalent of 500 espressos, a level so high that it would kill a human." The secret lies in the gut bacterium *Pseudomonas fulva* that can metabolize the caffeine so well that there are no traces of caffeine in the beetles' faeces.

Contrary to its toxic effects on pests, caffeine attracts pollinators. It enhances the pollinators' long-term memory so that they'll keep returning to the same coffee plants, thus increasing foraging efficiency, resulting in more effective pollination so that more fruits and seeds are produced.

A Look at the Recent Election in Honduras by Doug Durno

On January 27th, 2022, Xiomara Castro was sworn in as Honduras' first female president amid a political crisis that threatened her plans for her impoverished nation.

Speaking at her inauguration, the leftist leader said she was leading a "broken" country -- but vowed to pursue social justice and transparency. Her election marks the end of the 12-year reign of the National Party, which was plagued by scandals and corruption accusations, and turned Honduras into a narco-state.

Ms Castro promised to tackle powerful drug-trafficking gangs and liberalize strict abortion laws. But her agenda has been undermined by a feud in her Libre (Free) Party. A crisis erupted when several members of Congress formed their own breakaway legislature. Though eventually resolved, this was an attempt by corrupt legislators to block Castro's good-governance reforms. Adding to Castro's difficulties is the fact that she lacks a majority in the Honduras Parliament even with the support of her coalition partners.

With about 60% of the country's 10 million inhabitants living in poverty, and tens of thousands having headed north in hopes of finding work in the United States, the new president has her work cut out for her. Honduras is the second poorest country in the Americas, trailing only Haiti. As well, Honduras has one of the world's highest murder rates, with political assassination a risk for any activist.

The Biden administration hopes Ms Castro will fight corruption, poverty and violence, long-standing problems that have helped fuel immigration to the U.S.

Almost immediately, Castro took steps to repeal the "laws of impunity" that the dictatorship of her predecessor Juan Antonio Hernández used to plunder the nation's treasury. Another target will be the so-called "law of secrets", which classifies information on state purchases and "through which the Hernández government covered up all its corruption."

On March 16th, a Supreme Court Justice of Honduras ruled Hernández should be extradited to the United



Xiomara Castro, the new President, is pictured above with husband Manuel Zelaya. He was president of Honduras from 2006 to 2009 when soldiers arrested him and flew him to Costa Rica.

Unconstitutional actions by both sides highlighted this 2009 coup. The military obviously cannot kidnap and take a Honduran citizen to another country. But Zelaya was trying to hold a referendum on convening an assembly to amend the constitution, defying a Supreme Court ruling that such a referendum would be illegal. Though Zelaya didn't specify why such an assembly was necessary, it was likely so that he could do away with term limits, allowing him to run for president again. The Supreme Court ordered his arrest and the military acted.

States to face drug trafficking and weapons charges. Honduras has for years been a key transit country for drugs smuggled from South America to the United States, and more recently got into cocaine production.

Mining is another issue. For decades, Indigenous groups have complained of legal and illegal mining on their ancestral lands. In March, the Castro government banned open-pit mining (Costa Rica did this in 2002) as well as cancelling environmental permits for mining operations.

Finally, with total debt of nearly \$17 billion - including \$11 billion in foreign debt - Ms Castro said "one of the first actions we will take will be to readjust that debt". Analysts say debt and the fiscal deficit could pose major challenges to the new government.

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