

# RAPHIA

Newsletter of Caño Palma Biological Station

## The Face of an Engineer (Page 5)



**On The Beach --  
In Search of Microplastics**  
See Page 8



Canadian Organization for  
Tropical Education & Rainforest  
Conservation

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Tom Mason's article on Page 11 focuses on forest creatures we often overlook. He's talking about smaller creatures like spiders and ants. However, as Amy mentions on Page 3, there's a large species (actually two) whose tracks we see on mammal survey. Yet the picture above is about the best we can do for viewing a peccary.

And it could be that our local peccaries can dance. That's what Amy, better known as Amy Cocksedge, speculated when she came across the chaos of the above-mentioned peccary tracks. She also provides a concise summary of some of the differences between the collared and white-lipped peccary.

By the way, the picture of the peccary above was taken with a camera trap. And where did we get the trap? To quote Amy's article again: "Luckily, Caño Palma has recently received a generous donation of six camera traps. Former research coordinator, Emily Khazan, received a grant for the camera traps through a crowd funding site..."

By chance, Emily is also featured in this issue. Look on Page 10 for a summary of her research, which focused on an animal that none of us overlook: the strawberry poison frog.

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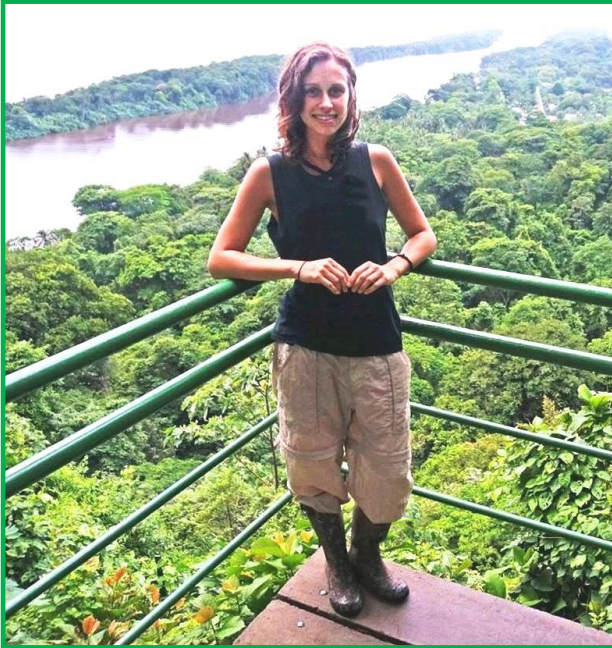
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## Pursuing Peccaries by Amy Cocksedge



Amy, seen here on the Cerro, is a former intern at Caño Palma. This is a slice of her tale of mammal survey. For the entire account, see the Fall 2017 issue of Raphia.

The ironic thing about mammal survey is that you rarely encounter an actual mammal. In fact, if it wasn't for the tracks you find, you'd be fairly certain that none existed and it was simply all a clever ruse. But, despite the lack of physical encounters, there are new footprints every week. Today you're on the Raphia trail, which runs behind the station. This is always an exciting survey because not only are there generally an abundance of tracks, but this means that the animals that made them were right behind the station where you live.

Soon, you come across a track you recognize as a peccary. There are two species in the area: the collared and the white-lipped. Collared peccaries are far more common in

this area, and their tracks are fairly easy to distinguish from the white-lipped. The closed toes of this footprint easily identify it as belonging to a collared peccary. You also know that these peccary travel in small groups of 2 to 6, compared with groups of up to 100 or more for the white-lipped peccary. However, you can't quite tell just how many collared-peccary tracks you are seeing. They seem to be going all over the place. If they were in a straight line it would be easy to determine the number. Unfortunately, these tracks seem to indicate the peccaries were having a dance-off. Because of the overlapping and chaos, there's no way to know for certain just how many there were. Based on the amount of tracks and your knowledge of peccary behavior, you and your team settle on 6 adult peccaries, and move on.

## A Little Bit About Peccaries



White-lipped



Collared



Chacoan

The 3 species of peccary are:

- White-lipped – *Tayassu pecari*
- Collared – *Pecari tajacu*
- Chacoan – *Catagonus wagneri*

Though these 3 species resemble pigs and boars (suids), they form their own family, called Tayassuidae. A few stomach structures demonstrate that peccaries are evolutionarily more advanced than Old World suids. Though peccary stomachs have 3 chambers, they don't ruminate. Being (cont'd on next page)

## A Little Bit About Peccaries (cont'd)

primarily herbivorous, their digestive systems are built for digesting coarsely chewed plants via large gastric pouches and a glandular stomach.

As social animals, they form herds of various sizes. This structure allows them to better defend territories and fend off predators as well as providing social interaction.

The snout is long, terminating in a roundish, cartilaginous disk, which includes the nostrils.

On their backs, peccaries have a scent gland that is used to mark their territory. But it's also a means of recognizing other members of the herd and keeping the herd together. They rub the glands against one another. The strong odor soon spreads to all herd members, creating a pack scent. Video of two peccaries doing this appear at [https://www.youtube.com/watch?v=f\\_u3neOT5pY](https://www.youtube.com/watch?v=f_u3neOT5pY)

But beware. If you hear a chattering noise coming from peccaries, keep your distance. When they feel threatened, this is a warning that they're prepared to be aggressive. They produce this chattering by rubbing together their sharp, protruding canines (aka 'tusks').

### The Peccaries' Journey to the Americas

Peccaries originated in Europe during the Late Eocene epoch about 35 million years ago. From there, they made their way to all continents except Australia and Antarctica. Eventually they became extinct in the Old World, and it's speculated that the evolution of pigs was at least partially responsible.

In our hemisphere, they first reached North and Central America. They didn't enter South America until about 2.7 million years ago as part of the Great American Interchange. That occurred when the Isthmus of Panama rose and provided a land bridge between the Americas.



White-lipped Peccary



Collared Peccary



Chacoan Peccary

## Peccaries - Engineers of the Forest by Doug Durno

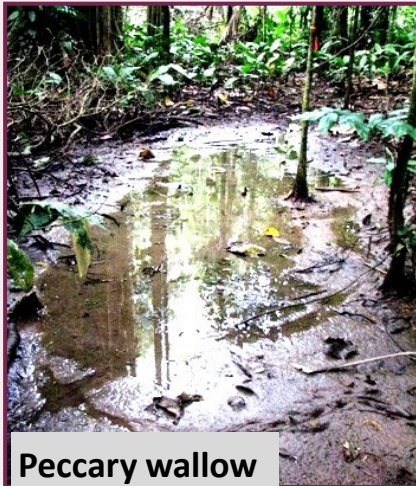
**Ecosystem engineers** – Any organism that can create, significantly modify, maintain or destroy a habitat. They can have a large impact on the biodiversity of an area. Examples are beavers, corals, trees and humans.

Most of us realize that beavers are engineers. They build dams, and in so doing, they alter their environment, creating ponds and wetlands that provide habitat for animal and plant species that hadn't previously lived there. Greater diversity results. In addition, the stillness of the pond allows pollutants like nitrates to be cleansed from the water.

### Now for the acclaimed ecosystem engineers - Peccaries:

1) Most mammals thermoregulate their bodies with evaporative cooling. A few like humans and horses produce enough sweat to do the job. Others, like dogs, accomplish it by panting; that is, moisture evaporates through the mouth. Peccaries can do neither. To keep cool, they tend to stay near water.

Or – they create **wallows**, muddy pools they roll around in. With up to 30 peccaries doing this over years of frequent visits, the wallows become larger and deeper. Not only that, but pond bottoms become



Peccary wallow

more compacted with a water-resistant layer of clay so that little water leaks into the ground.

Result: During dry season, natural ponds and puddles lose water as the groundwater table drops, and

often dry up completely. On the other hand, the compacted peccary wallows will retain their water for a longer period – a great benefit not only for the peccaries, but also for pond life.

Frogs (including toads) particularly benefit. Dr.

Harald Beck, a researcher in tropical rainforest, has identified at least 10 frog species that use wallows for foraging, mating, and laying eggs. Some are so bound to wallows that one study found that the extirpation of peccaries from an area caused a die-off in several species of frog .

Other research has found that peccary wallows have a greater density of all stages of frog metamorphosis than natural ponds do. Greater species diversity ensues.

As another benefit, the wallows can act as stepping-stones through the forest. Frogs and toads radiate out greater distances, increasing genetic diversity throughout the area.

But it goes farther than frogs. Beck found that the wallows he researched are used by all kinds of aquatic insects (e.g. beetles, dragonflies and mosquito larvae), water spiders, mussels, tapirs, ocelots, agoutis, 9 species of fish, and 2 species of snake. Or as Beck more colorfully said: "Everyone and their grandmother comes here,"

Note: Peccaries roll around in a wallow for other reasons besides (cont'd on next page)



## Peccaries - Engineers of the Forest (cont'd)

thermoregulation. Wallowing can also remove parasites. And it can just be for fun. Beck says they act like little kids, splashing around.

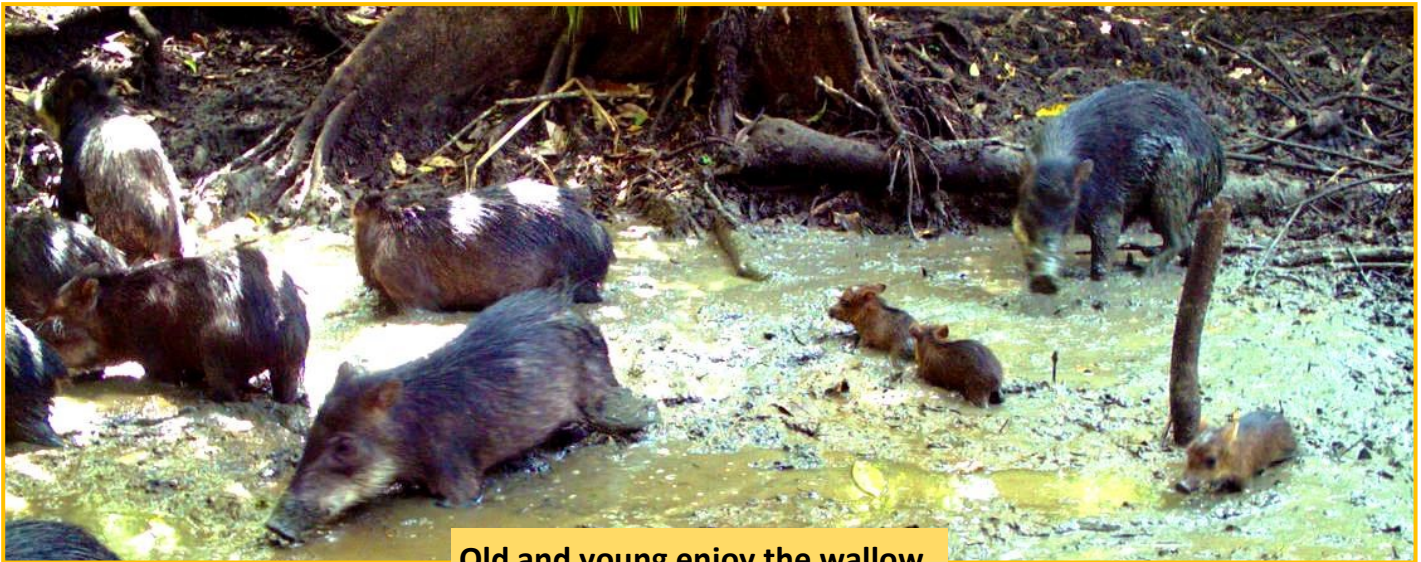
2) Peccaries also engineer the **forest floor** just by doing their usual foraging. They trample and shuffle the leaf litter, turn the soil and leaves over, and alter rooting. This can change the structure of the litter, thus altering the habitats of the reptiles and leaf-litter amphibians that forage, mate and often dwell there. The litter also harbors insects that they eat. The reptiles, amphibians and insects are all sensitive to structural changes in the litter. Leaf litter reduces extremes of moisture and temperature. So, when peccaries trample leaves, creating a thinner pile, this appears to be detrimental to the creatures that dwell in it. However, research has been conflicting.

3) Peccaries eat fruit and seeds primarily. Given their size, they obviously ingest a lot of seeds. In fact, they consume the seeds of 50 different plants. Since they

travel some distance in their search for food, they are **seed dispersers**, helping to maintain the presence and diversity of various plant species throughout the forest.

But peccaries also have stomachs like ruminants, enabling them to digest, via thorough chewing and pre-gastric fermentation, about 75% of the seeds they eat. Thus they destroy more seeds than they disperse, giving them the label **seed predators**. This helps maintain plant diversity because it prevents the dominance of plant species that are better able to compete.

**Conclusion** – As ecosystem engineers, peccaries alter their environment, affecting the lives of other animals and plants. This is generally positive, but it can also have negative effects. Conversely, the extirpation of peccaries from an area can alter the ecosystem, generally not positively.



Old and young enjoy the wallow

### References

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[https://www.researchgate.net/publication/286458795\\_Digestive\\_seed\\_dispersal\\_and\\_predation\\_by\\_collared\\_peccaries\\_in\\_the\\_southern\\_Bahian\\_Atlantic\\_forest](https://www.researchgate.net/publication/286458795_Digestive_seed_dispersal_and_predation_by_collared_peccaries_in_the_southern_Bahian_Atlantic_forest)

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## Notes from the Station by Charlotte Foale

Working at Caño Palma, we get to live with some of the most amazing and dedicated people. Interns and volunteers as well as those who step into leadership roles, and help us to drive the projects forward.

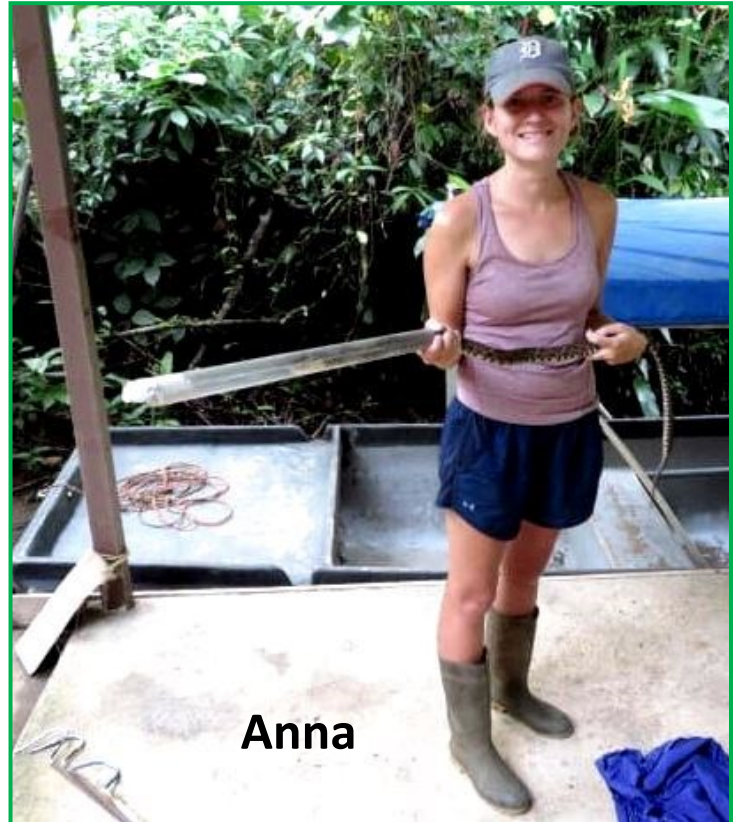
This month 10 move on, and they have dedicated an extraordinary amount of effort, for which we will continue to be grateful. Of these 10, two have been with us for the past two years, and touched the lives of everyone they've worked with.

Anna Harris arrived here as our Research Coordinator in July 2017 from Michigan. With previous experience working in Costa Rica, as well as some time in Ecuador, she quickly adapted to the crazy lifestyle of Caño Palma. With a background in and Masters' focus on macroinvertebrates, she had a massive task getting up to speed with the variety of undergraduate and post-graduate projects that she supervised. From marine debris to large mammals, plants to macaws, she met the challenge head on and did an excellent job. The great relationship she fostered with local authorities is demonstrated by the multiple farewell visits and pizza party, thrown by the local coastguard. We wish her the best as she moves forward, and we're looking forward to her publication from our macaw data!

This month we also lose Nicole Allison. She first joined us to work on her Masters' project, using data from our marine-turtle project. So impressed by her work ethic, knowledge and leadership, we invited her back after her graduation to lead the turtle project. After a quick trip home to Scotland over Christmas, she joined us again for the 2019 season. While we knew that she was applying for PhD projects, we didn't expect her to be whisked away so soon. While we're thrilled that she was accepted so quickly, nobody was ready to say good-bye.

Good friends and colleagues, we wish both of these women extraordinary success in their futures, and we hope to see them back someday.

Thank you!



**Anna**



**Nicole**

## Microplastics and Nesting Success by Laura Tilleman

*Laura is a student at HAS University in the Netherlands.*

Since 1992, global plastic production has been steadily increasing. Plastics provide many benefits, including high durability. However, durability also makes plastics a great threat to the environment since it makes their disposal almost impossible.

The marine environment is affected by 10 to 20 million tons of plastic that end up in the oceans every year, making up 60-80% of all marine debris. It's already known that marine debris is harmful to marine species and can sometimes lead to their death. Furthermore, the presence of plastics has been demonstrated on various beaches regardless of their isolation, sand type, or current patterns.

Over time, smaller-sized plastics can originate from megaplastics due to biodegradation 1) by enzymes, which can break down plastics directly; or 2) by UV radiation, which causes photooxidation, breaking down plastics into smaller particles. Megaplastics might be seen as the biggest threat to the environment because they're clearly visible with the naked eye. However, the environment-threatening properties of microplastics should not be overlooked as they can be ingested by smaller organisms, resulting in biomagnification, an increasing accumulation of the microplastics in larger organisms as they work their way up the food chain.

Besides the dangers of ingestion, microplastics can also be found up to 2 metres deep in beach sediment, making them a factor that interferes with the properties of the sediment. Properties affected by the presence of microplastics include sediment permeability, sediment temperature and heat diffusivity. When plastic is present in larger grain sizes, the permeability of the beach sediment is greater, making it easier for fluids to pass through the sediment. In that case, heat diffusivity decreases since, when more plastic is

present, a decrease in sediment temperature is observed. The change in these beach properties can in turn affect various organisms that utilize the beach during their life cycle. A good example is marine turtles, which lay their eggs in the beach sediment. Changes in sediment temperature and permeability can impact the nesting success of marine turtles. The changing temperature can alter the length of the incubation period, as well as the sex ratio of the nest, whilst an increased permeability can cause dehydration of the eggs.

Before I get into my research, I want to thank all those at Caño Palma who worked so hard in assisting me. From April 28<sup>th</sup> to December 3<sup>rd</sup> 2017, they took core sand samples during each trimester-- that is, 3 times in total -- from above the egg chamber of each marine-turtle nest along Playa Norte. Many spent their afternoons and spare time helping to do the tedious job of analyzing the numerous sand samples under a microscope. **Thanks to them, I was able to complete my research into whether the concentration of microplastics in beach sediment affects marine-turtle nesting success.** (cont'd on next page)



**Laura (R) with Irune Maguregui Martin working on identifying microplastics under microscope**



## Microplastics and Nesting Success

(cont'd)

Nesting success was determined by 2 things: hatching success and emerging success. My research showed the following:

1. Did microplastic concentration have a significant influence on hatching success?

No.

2. Did average microplastic concentration over time significantly influence emerging success?

Yes – higher average microplastic concentration in the beach sediment resulted in higher emerging success.

These conclusions contradict the results of many previous researchers. For instance, it's been found that microplastics can affect permeability and heat diffusion in the sediment. Because of this changing sediment temperature, microplastics affect the incubation period, which can affect the sex ratio of the hatchlings or cause dehydration of the eggs. Others have found that chemical and toxic substances in the plastics affected reproductive development and cause decreased reproductive success.

Given these contradictory results, I had to go back and assess the reliability of my own results. They could have been affected by the low sample size. Given that and the high standard deviation of my data, I can't assume that a higher microplastic



concentration causes a higher emerging success rate.

A further impediment to giving high significance to my results was the relatively low concentration of microplastics found in the sediment. This could be due to the difficulty of identifying microplastics in the sample when using a stereomicroscope. Scientists have shown that relying on a stereomicroscope can produce false results and identifications. Furthermore, visual ID for plastic particles smaller than 1 mm is not reliable. There were other issues as well.

So, perhaps the most significant finding to come out of my research is the need for improved protocols. Hopefully, my paper can improve future research at the station.

## Slang terms taken from Tico Times

**Tuanis:** Means "good" or "cool" and is used at times like the expression *pura vida*. It isn't derived from the English phrase "too nice" as many believe.

**Vara:** Is a "thing" and similar in meaning to *chunche*. It may also be used in many other ways such as "*Qué es la vara?*" which means "What's up?" or "What's the deal?". The word can also be used to indicate a joke: "*Son varas, man*" means "Just kidding, man."

**Chunche:** Is an all-purpose word that can refer to almost any thing or object.

**Cuidado pierde:** This expression is really popular nowadays and means "you can't go wrong", "can't miss", or "you can't lose."

**Un Aguila:** Literally means "eagle", but is used to refer to Imperial beer because it has an eagle on its label. If you ask for an "*águila*" you will be served an Imperial.

**Una teja:** Is slang for 100 colones (the official currency). It is also synonymous with the distance of one block, or 100 meters. Finally, there is a daily newspaper called *La Teja*. Originally it cost 100 colones, giving it its name. As of May 2019, the newspaper costs 250 colones (two and one-half *tejas*).

## Nursery Crowding Cavity-Breeding Frogs by Emily Khazan

This continues our glimpse at some of the published papers based on research that has taken place at Caño Palma Biological Station.



They're charismatic little guys. Even their name - strawberry poison frog - is intriguing. And the color morph that we all want to see when we get to Caño Palma is of course what we call the blue-

jeans frog - because it looks like it's wearing jeans. This morph is iconic among the poison-dart frogs.

Emily Khazan, one of the authors of the featured paper, was research coordinator at the station in 2014 and 2015. She has been back to the station to carry out further research. Emily is currently in a PhD program at the school of Natural Resources and Environment at the University of Florida. Here's a link to her article "Nursery crowding does not influence offspring, but might influence parental, fitness in a phytotelm-breeding frog". Co-authors are Tom Verstraten, Michael P. Moore and Matthew B. Dugas.

<http://www.coterc.org/all-resources---by-year.html> (Scroll down a bit to "2019")

Here's Emily's summary of her paper:

"Blue-jeans frogs", also known as "strawberry poison frogs", or *Oophaga pumilio*, are common in the lowland forests of Costa Rica. Females are sometimes seen with tadpoles on their backs. They're carrying them to small containers of water in trees, bromeliads, and leaf axils that will serve as nurseries for the developing offspring. Parents must decide not only which nurseries to use, but also how many young they should deposit into each. In our paper, we explore the factors shaping these decisions in the strawberry poison frog. While they do not appear to choose nurseries based on size (and volume of water available), parents were more likely to deposit multiple tadpoles into larger nurseries. We encountered many nurseries with multiple tadpoles. We found that the number of tadpoles in a nursery did not influence likelihood of metamorphic success for each individual, so nurseries that contained multiple tadpoles were more likely to produce at least one offspring that completed metamorphosis. These results highlight how important it can be for animals to use (and be able to use) multiple strategies to reproduce, and how parents and offspring benefit in different ways from these strategies.

## Notes on Some Little-Known Heroes of the Forest by Tom Mason

You're in some isolated part of Costa Rica. It's past midnight. It's raining. A light is sporadically moving through the rainforest. That would be Tom Mason. He'll be looking under rocks and into holes for snakes, spiders and any other reptiles or amphibians he can examine. Tom is a long-time supporter of the station and has served on the Board in various capacities. This article comes from the Winter 2008 issue of *Raphia*.

Everybody's heard about jaguars and monkeys, but few people realize that it is the little creatures that make the rainforest what it is. Spiders, katydids, treehoppers, flies and ants (you can't forget ants) are the creatures that ensure that the forest runs smoothly. Vegetarian insects, such as the treehoppers and katydids, busily eat holes in leaves and flowers while hiding from all those other creatures that would like



**Treehopper - *Umbelligerus woldai* - found in Costa Rica**

to make them their next meal. Mind you, many types of katydids have widened their appetites – there's one species that has grown large spines on its legs that are used to entrap insects, which it can grab and devour alive. Others may just eat pollen from flowers. There are flies and beetles that devour dead organic matter that helps decompose the material to a level where fungi and microbes can further create the nutrients that make the forest so green.

And then there are the spiders. Often, they're the most visible creatures in the forest. Each spider family shows itself with a specific shape and strength of their webs. Some build a new web each night, while others fill the spaces where the sun breaks through the canopy. On a first visit, many people believe that spiders are the most common animal of the forest. In reality they are just a small part of the ecosystem.

There are other creatures in the forest and each is a small piece of the puzzle. But surprisingly when it comes to animals, one type dominates the forests. They are the top predators and pollinators, move more soil than earthworms, disperse seeds as well as

being the number one herbivore in South America – that's the ants. It's said that E. O. Wilson found 73 species in one tree. Ants create refuse piles that become a source of nutrients for living plants and a nursery for seedlings, and they ensure that no species gets too numerous. The biomass of animals they consume is greater than all predaceous birds, mammals, reptiles and amphibians in the forest combined. A single colony of leafcutter ants can have 2.5 million individuals. When a colony of army ants moves into an area, all animals (including people) relocate or take cover. Nothing in the natural forest stands in their way. Yet there are beetles that have learned to trick them and use them as a source of food and protection. As well, there are large numbers of birds that follow the ants to take advantage of the small insects and other edible creatures that break cover when the ants move in. Even the people of the forest welcome the ants because they know that when they leave, most of the pest species such as roaches, spiders and scorpions will have been cleaned out and it will take time before they again become a problem.

**Rhinoceros katydid (*Copiphora rhinoceros*) - found in Costa Rica**



So the next time you're watching a program on primates or see a magnificent jaguar in a zoo or on TV, or even if you are lucky enough to actually visit a living, breathing rainforest, remember that it is the little creatures that actually make that forest tick and allow that beautiful creature you're watching to survive. It is one of those wonders that keeps me going back to see and learn just a little more.

## Station Happenings

Taken from Research Coordinator Anna Harris's reports

**March** **Greg Davies** – Greg is a notable ornithologist and one of the authors of "Roberts Bird Guide", a field guide to the birds of southern Africa. Accompanied by his assistant Aisling Farrell, he was assessing our area to determine if conducting a study on sungrebes would be feasible. Their survey was productive as they saw sungrebes nearly every day.

**April** **Rainfall** – Only 73 mm of rain fell this month. This was a huge dropoff from last April's deluge of 629 mm. Mean canal depth has now decreased for 5 months in a row. It's down to 1.16 m from November's mean of 1.4 m

**Otter survey** – The count of scat piles was quite high this month - 214 piles being found on 10 otter surveys.

**Acoustic recorders for bats** – Adrianna Arias-Aguilar, a PhD student focusing on bat acoustics, set up 3 acoustic recorders overnight along the canal and in Laguna Cuatro.

**Bert Jan Assink** – This Dutchman left the station after a long residency at Caño Palma. An avid birder, we pass on our thanks to him for all his help with macaw surveys.

**Ella Wooden** – Another long-term mixed-taxa intern, we wish Ella well as she embarks on some travels through South and Central America.

**Amelie Courbon** – Many thanks Amelie for all your hard work over the last two months.

**Volunteers** – Caño Palma welcomed Charles Rumero (Canada), Marie and Denise Dickenson (USA), Clara Bertrand (France) and Thibaud Gravier (France) for varying lengths of time.

## El Cerro



**Beautiful Caño Palma** by Melissa Zanartu

Peacefulness, lights out  
creepy crawlers move about,  
Little bats under our dock,  
and Juancho the caiman spooking our dog.

Our pooch's name's Maggie,  
she comes and she goes,  
calls out for intruders,  
sometimes even toads.

Spider monkeys and howlers,  
colourful toucans, loud growlers,  
are all our neighbours here at the station,  
...so what is so beautiful 'bout all this invasion?

It is "we" who invade, their serenity, their shade,  
and it is them who take us in, who make it all better,  
this World we live in.

Caño Palma's true beauty,  
turtles-a-hatchin', and army ants marchin',  
birds-a-singin', it's all about livin'

Caño Palma's true colours,  
come alive to all lovers,  
Lovers of sunshine, lovers of rain,  
lovers of forests, and sandy terrain.

# Pleased, Pleased, Pleased to Meetcha - the Chestnut-Sided Warbler

by Doug Durno

John J. Audubon was considered the leading naturalist of his time. But being a naturalist in the first half of the 19<sup>th</sup> century involved some different methods from today. Here's the start of Audubon's comments on his investigation of the chestnut-sided warbler:

"In the beginning of May 1808, I shot five of these birds, on a very cold morning, near Pottsgrove, ... Pennsylvania."

Uh-oh. A top naturalist/ornithologist shooting birds. Yikes. With the way we now judge the past by present-day standards, maybe Audubon should be excommunicated from the Audubon Society, the huge organization dedicated to preserving birds and their habitats in his name. But how else was he to examine birds? He couldn't use binoculars for the very good reason that binoculars of a compact size capable of sharp vision weren't refined till the 1890s.

In the same paragraph, Audubon went on to say that, despite plenty of searching, he "never met with a single [chestnut-sided warbler] since". At that time, the eastern United States and Canada were mostly covered with old-growth forest, unsuitable habitat for this species.

But looking ahead, change was afoot. Immigrants began arriving and clearing away that primeval forest to do a little farming. Still, open fields weren't favored by the chestnut-sided either. Then, homesteads began to be abandoned. Soon, they were overgrown with brush and second-growth forest – habitats favored by the chestnut-sided warbler. As a result, as *The Field Guide to North American Warblers* states: the chestnut-sided warbler "underwent a spectacular increase in range and abundance".

Further evidence by personal observation: during this year's spring migration, chestnut-sided warblers flitted through the trees in my backyard in unprecedented numbers for about 3 weeks. They were matched only by yellow warblers.

So, there is a little good news from our habitat-altering era.

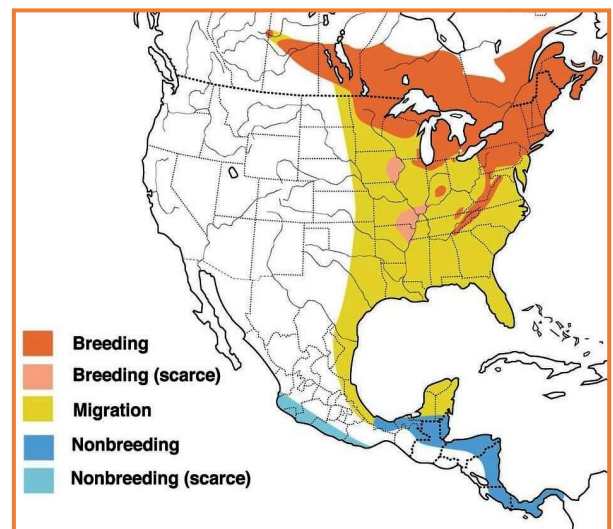
In winter, the Caño Palma area is a good place to spot chestnut-sided warblers. In fact, the Caribbean lowlands are their prime migration route. They go as far south as northern Colombia. You'll find them in second-growth forest and forest edges.

## Notes

- The title of this article is a mnemonic for the springtime song used by the male chestnut-sided to introduce himself to females.
- To identify this species, look for chestnut sides (duh) and a yellow crown. Often it'll be hanging upside down on a slender branch, searching for caterpillars and bugs on the bottom of leaves. Insects make up almost all their summer diet. In winter, down south, they add berries.
- In eastern North America, a few warblers, including the chestnut-sided, are voracious predators of the eastern spruce budworm, which is a major threat to spruce and fir trees. Some of these warblers are in the genus *Setophaga*, which translates from the Greek as 'moth eater'.

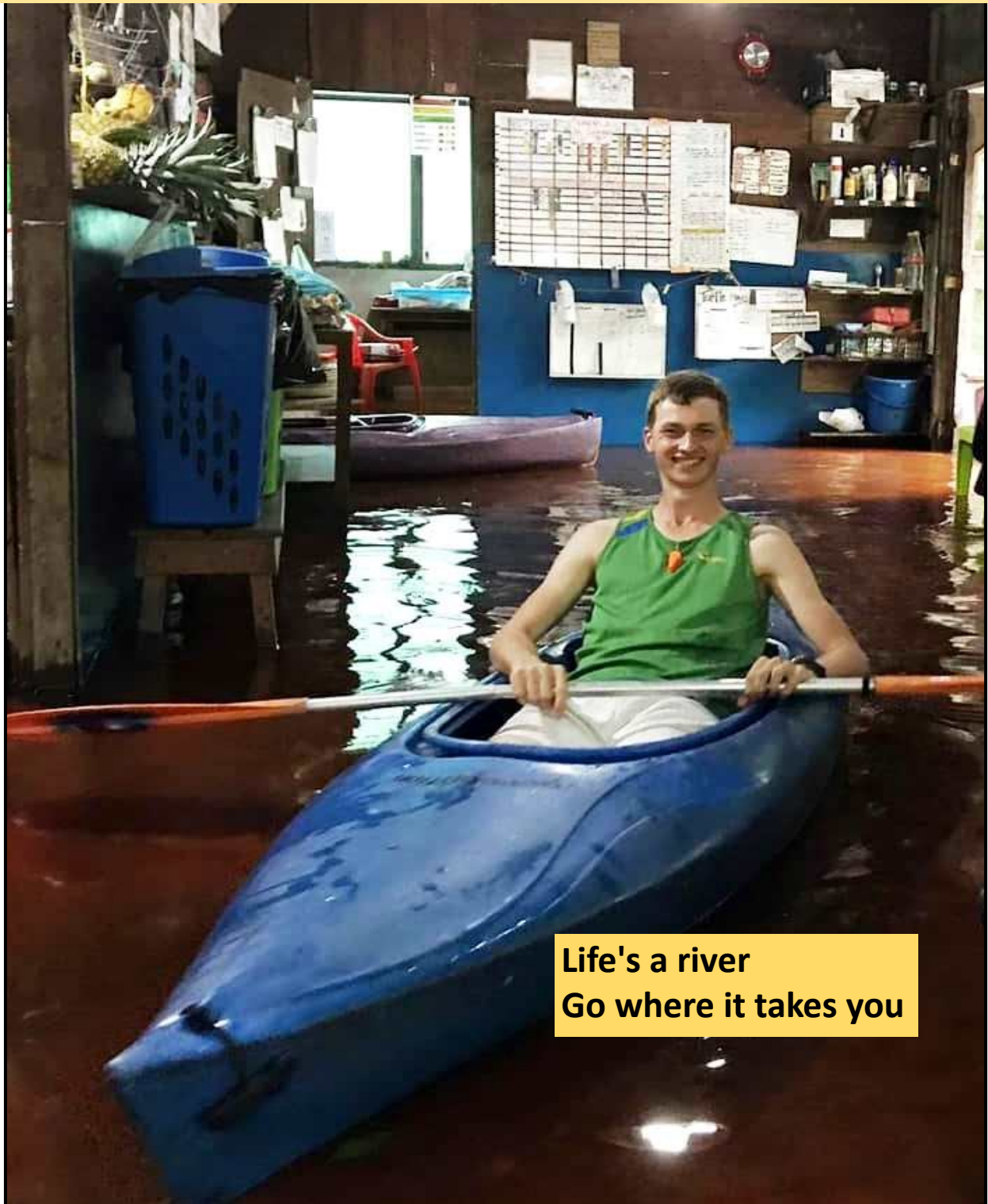
## Reference

<https://www.audubon.org/news/meet-john-james-audubons-nemesis-bird-chestnut-sided-warbler>





**Low. Land. Rain. Forest. The name should be adequate warning. CFoale**



**Life's a river  
Go where it takes you**

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