PHOTO: ANDREA MÜLLER

A practiced team: many plant species belonging to the *Tococa* genus live symbiotically with ants. The small insects keep pests at bay. In return, the plant provides the ants with food and shelter.

Max Planck researchers are currently collaborating with partners in over 120 countries. In the following article they talk about their personal experiences and impressions. Andrea Müller from the Max Planck Institute for Chemical Ecology in Jena spent four months in Peru. She has been studying plants that live symbiotically with ants in the Tambopata National Reserve in the southeast of that country. Below, she shares her enthusiasm for the rainforest and how, in addition to the coronavirus, protesting coca farmers can jeopardize scientific field work.

For me, the rainforest is nature in its purest form. Nowhere else in the world is there so much life and biodiversity. It always thrills me to wake up early in the morning to the sounds of birds and monkeys, to breathe in the fresh air after a tropical downpour, and to experience the countless plants and animals. My passion for the jungle has taken me to South America once before. I went to work as an intern on a reforestation project in Ecuador. Back then, we lived in the middle of the forest, a three-hour walk from the nearest road. There was no electricity, and we got our drinking water from the river. Afterwards, I backpacked across the continent alone, traveling from south to north. It was a stroke of luck when the Max Planck Institute in Jena offered me the opportunity to conduct research in Peru.

My doctoral thesis focuses on plants within the *Tococa* genus, which live symbiotically with ants. The plants provide the insects with shelter in the form of specialized cavities. In addition to sheltered accommodation, the ants also receive food in the form of nectar. In return, the ants defend the plant against predators, such as caterpillars. I'm interested in discovering exactly how the partners live together symbiotically. Are the plants still able to successfully defend themselves using their natural chemical defense, even when no ants are present? Or do they perhaps only start specifically attracting ants when they are attacked by caterpillars? To find out, I compare plants that are colonized by ants with those from which I have removed the ants. I collect samples of volatiles and leaves to analyze their chemical constituents at the Institute in Jena.

The plants I study grow in the Tambopata National Reserve in southeastern Peru. Just getting there is an adventure: from Lima, you fly over the snow-capped Andes and the Amazon rainforest to Puerto Maldonado. From there, you continue for about three hours in a wooden boat, traveling upstream on the Río Tambopata to the lodge, passing capybaras, turtles and caimans sunbathing on sandbars along the way.

The lodge's wooden cabins are usually occupied by tourists and scientists from all over the world. However, during my last stay, the COVID-19 pandemic meant that there was no-

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one there except me and Victor, the manager of the facility, and his family. We met regularly for meals and every now and then for a night excursion. The light of a flashlight often reveals frogs, and occasionally spiders and scorpions. They don't bother me in the least. But I'm afraid of snakes – all the more so as Peru is home to numerous venomous species.

I have sixty *Tococa* plants growing in a clearing about ten minutes from the station. The footpath to get there leads across a small river with a now weathered wooden bridge. It's always nerve-wracking to haul my aluminum boxes over the bridge to the site. They contain liquid nitrogen and expensive research equipment to obtain and preserve the scent samples. If something were to happen to the equipment, I wouldn't be able to find a replacement in Peru.

On one of my last field trips, I wasn't able to collect any volatiles because my equipment got stranded in the middle of nowhere on route. When I fly to Puerto Maldonado from Lima, I send the heavy equipment ahead in the bus. One time, the bus was unable to move for days because protesting coca farmers had set up a roadblock. The boxes didn't arrive until I was just about to leave. All I could do was send them back the same way they came.

Notwithstanding such mishaps, I've now successfully completed my experiments. It's a relief, in particular because I lost a lot of time at the beginning of the corona pandemic. During the spring of 2020, I was stranded in Lima for weeks; I wasn't allowed to set foot on the university campus because of the lockdown, nor could I get a return flight to Europe. But after six weeks I managed to catch a flight to France and traveled home from there. If all goes well, I'll be completing my doctorate within the next year. After that, I definitely want to go back to Peru again. As for the future, I hope it involves ant-plants or other adventures!

PHOTO: PRIVATE

Andrea Müller

29, studied biochemistry and chemical biology at the University of Jena. For her bachelor's and master's degrees, she conducted research at the Max Planck Institute for Chemical Ecology in Jena. She has been a doctoral researcher in Axel Mithöfer's working group there since February 2018. In Peru, Andrea Müller has studied the symbiosis between tropical plants and ants.