

## Guardians of the Amazon's biodiversity

In the heart of the Brazilian jungle, a ground-breaking study is underway to understand how mammals, birds and insects help the forest regenerate. The results will help local stakeholders deal with the harmful impacts of human activities and climate change.



Did you know that a large tree in the Amazon rainforest can store the equivalent of the annual CO<sub>2</sub> emissions of four people in France (around 40 tonnes of CO<sub>2</sub>)? Scientists have for years been analysing the mechanisms that give plants this power to regulate the climate. Tropical forests are particularly effective carbon sinks.

While scientific studies on this topic are essential, they often have limitations: many are based on short-term observations and focus solely on plants' capacity to store CO<sub>2</sub>. But tropical forests play a much larger role than that. They are an extraordinary web of life with each element dependent on the health of the whole. In the Amazon, 400 species of mammals and 1700 species of birds have been identified; as for insects, scientists estimate that the rainforest is home to 2.5 million species, though many have yet to be described. This fauna depends on the forest's trees, just as the trees depend on it. An example: the birds that eat the fruit of tropical palms then disperse the seeds in their

droppings, allowing new seedlings to grow. Yet these complex interactions are often little understood.

In Santarém, a small city on the Amazon River in Brazil, a pioneering science project was launched 10 years ago to investigate the key role of mammals, birds and insects in the maintenance and regeneration of the forest. Supported by the BNP Paribas Foundation's 'Climate & Biodiversity Initiative', the BIOCLIMATE project is conducting an extensive evaluation of the forest's biodiversity and the associated ecosystem processes. This includes the long-term observation of the spatial distribution of fauna to understand its interactions with trees.

The findings will help local stakeholders to design more effective measures to help protect the rainforest. This is urgent, as these lungs of our planet are facing many threats: fires, drought, deforestation for cattle ranching or timber. Between the pressures of human encroachment and the consequences of climate change, rainforests are in peril. Their fauna has an indispensable role to play in ensuring their preservation.

Understanding this role starts with knowing what you're dealing with. The first step is surveying the rainforest's residents. While counting trees may be tedious, it's not rocket science. For birds, mammals, and insects, it's a different story ... First, because there are so many of them. In the area around Santarém, a single hectare of forest can contain up to 160 species of birds. Second, unlike plants, animals are constantly on the move. The number of birds in a given area can vary greatly over the course of a year, a week, or even a day.

To meet this challenge, BIOCLIMATE's researchers have had to come up with innovative methods to monitor the area's wildlife. For example, they have set up audio recorders around the forest to capture bird song. This makes it possible to count large bird populations without onerous human effort.

And to overcome the difficulty of identifying the bird calls, the researchers are employing artificial intelligence. Although an expert can identify up to 12 species in a 32-second recording, the machine-learning algorithms the scientists are developing will enhance their performance. The findings from this survey will help to better understand the dynamics of the forest's occupation by birds, crucial contributors in the dispersal of seeds and the growth of new trees.

BIOCLIMATE is also studying insects, with one of particular importance: the dung beetle. This large black beetle has the advantage of being easy to spot and collect. It is coprophagous, meaning it feeds on excrement, so it depends on other animals producing droppings. This means that when researchers analyse the DNA in the dung it collects for food or to make breeding chambers, they learn a lot about the presence of the mammals in the rainforest. Working back from this, they can establish links between the forest's animals and the ecosystem's ability to regenerate.

The ultimate objective of the BIOCLIMATE project is to aid conservation managers and local authorities protect their environment. This will be supported by the unprecedented library of knowledge being built up on the interactions between the tropical forest and the creatures that inhabit it. An ecosystem whose species have evolved together over millions of years. And whose survival is vital in enabling the Earth to remain habitable for another species ... our own.

**Arthur Hily**