

Who lives in the rainforest treetops? DNA-collecting drone provides insights

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Credit: *Environmental Science & Technology* (2024). DOI: 10.1021/acs.est.4c05595

Squinting into the treetops won't reveal the tiny organisms up there. But these creatures leave clues, in the form of DNA, on the leaves and branches. Now, researchers [report](#) in *Environmental Science & Technology* that they have developed a way to collect this genetic

material: a drone with a specialized fabric probe. The team flew the drone above the rainforest and, based on DNA collected by the probe, identified the invertebrates in the canopy.

"If we want people to protect nature, we need to tell them what we are actually protecting—with our solution, we hope to better understand the life in the canopy," says the study's lead author, Steffen Kirchgeorg.

Drones go where people can't or shouldn't go, including remote, protected or inaccessible locations. So, researchers have started to use aerial robots to take pictures, deploy sensors and collect samples in the [forest canopy](#).

To identify the species living in and around trees, samples are taken of genetic material left on leaves and branches. This environmental DNA (eDNA) comes from mucus, feces and dead skin cells. However, if a drone outfitted with swabs to gently collect eDNA accidentally collides with a tree, both the robot and plant can be damaged. So, Kirchgeorg, Stefano Mintchev and colleagues wanted to design a sampling system that keeps the drone out of the vegetation.

They developed a drone sampling system with a specialized fabric probe that brushes against branches and leaves to collect eDNA. When a remote pilot activates a pulley underneath the drone, a tether lowers and raises the probe through the canopy.

The system includes a piece of fleece cloth cut into a circle, similar in shape to a coffee filter, with strips of fiberglass attached to provide structure. In addition, a sensor keeps the probe's tether from tangling on branches: If it detects an impact, the researchers programmed the system to automatically shift position before completing the drop or retrieval.

In proof-of-concept demonstrations, the researchers flew their drone

into a rainforest in Southeast Asia, sending it beyond their line of sight to retrieve [genetic material](#) from trees 10 different times. When the [drone](#) returned from the flights, the researchers removed the fabric and extracted eDNA from each [probe](#) before bringing the samples to a lab for analysis and [species identification](#).

Across the 10 separate samples, most of the organisms detected were arachnids and insects. Additional species of note, according to the researchers, include the long-tailed macaque (monkey), multiple ant and termite species, and a type of fly called the gall midge. The study presents another way to study biodiversity in remote habitats, which the researchers say is critical for conservation and restoration initiatives.

More information: Steffen Kirchgeorg et al, eProbe: Sampling of Environmental DNA within Tree Canopies with Drones, *Environmental Science & Technology* (2024). [DOI: 10.1021/acs.est.4c05595](https://doi.org/10.1021/acs.est.4c05595)

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