

# AI models identify biodiversity from animal sounds in tropical rainforests

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The Banded Ground Cuckoo (*Neomorphus radiolosus*, left) and the Purple Chested Hummingbird (*Polyerata rosenbergi*) are among the birds recorded in tropical reforestation plots in Ecuador. Credit: John Rogers / Martin Schaefer

Tropical forests are among the most important habitats on our planet. They are characterized by extremely high species diversity and play an eminent role in the global carbon cycle and the world climate. However, many tropical forest areas have been deforested and overexploitation continues day by day.

Reforested areas in the tropics are therefore becoming increasingly important for the climate and biodiversity. How well biodiversity develops on such areas can be monitored very well with an automated

analysis of animal sounds. This was [reported](#) by researchers in the journal *Nature Communications*.

## **Recordings on former cocoa plantations and pastures**

As part of the DFG research group "Reassembly," the team worked in northern Ecuador on abandoned pastures and former cacao plantations where [forest](#) is gradually reestablishing itself. There, they investigated whether autonomous sound recorders and [artificial intelligence](#) (AI) can be used to automatically recognize how the [species](#) communities of birds, amphibians and mammals are composed.

"The research results show that the sound data reflect excellently the return of biodiversity in abandoned agricultural areas," says Professor Jörg Müller. The head of the Ecological Station Fabrikschleichach at Julius-Maximilians-Universität (JMU) Würzburg and his colleague Oliver Mitesser were in charge of the study.

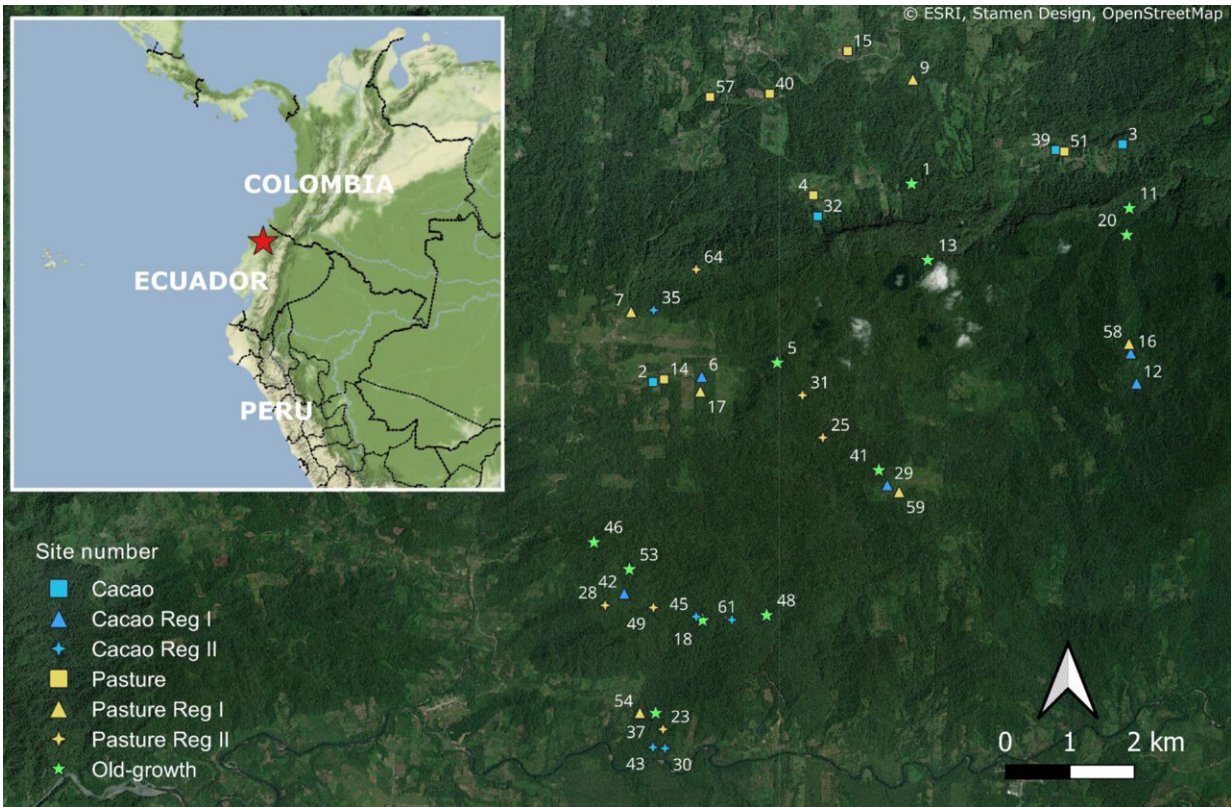
Overall it is particularly the communities of vocalizing species that mirrors the recolonization very well—because the communities follow strictly the recovery gradients. A preliminary set of 70 AI bird models was able to describe the entire species communities of birds, amphibians and some calling mammals. Even the changes in nocturnal insects could be meaningfully correlated with them.



Sound recorder and automatic light trap for recording voices and night insects.  
Credit: Annika Busse

### **AI models are being further refined**

The team is currently working on further improving the AI models used and expanding the set of models. The goal is to be able to automatically record even more species. The models are also to be established in other protected areas in Ecuador, the Sailershausen JMU Forest and in Germany's oldest national park in the Bavarian Forest.



The research areas of the sound study are located in the north of Ecuador.  
Credit: Constance Tremlett

"Our AI models can be the basis for a very universal tool for monitoring biodiversity in reforested areas," says Müller. The Würzburg professor sees [possible applications](#), for example, in the context of certifications or biodiversity credits. Biodiversity credits function similarly to carbon dioxide emissions trading. They are issued by projects that protect or improve [biodiversity](#). They are purchased by companies or organizations that want to compensate for negative impacts of their activities.

**More information:** Jörg Müller, Soundscapes and deep learning enable tracking biodiversity recovery in tropical forests, *Nature Communications* (2023). [DOI: 10.1038/s41467-023-41693-w](https://doi.org/10.1038/s41467-023-41693-w).

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Provided by University of Würzburg

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