

# Are coffee farms for the birds? Yes and no

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Male turquoise cotinga, threatened with extinction. This is the only known instance of this bird being caught and banded. Credit: Cagan Sekercioglu/University of Utah

Over 11 field seasons, between 1999 and 2010, ornithologist Cagan Sekercioglu trekked through the forests and coffee fields of Costa Rica to study how tropical birds were faring in a changing agricultural

landscape. Through painstaking banding of individual birds, Sekercioglu asked whether the expansion of coffee plantations is reducing tropical bird biodiversity.

The answer, published this week in *Proceedings of the National Academy of Sciences*, is no. And yes. Sun [coffee](#) plantations are able to host a surprising number of bird species, even more if the [plantation](#) has some tree cover. But the plantations are not enough to maintain bird biodiversity.

"It's two sides of a coin," Sekercioglu says. "These tropical agricultural habitats that are mostly deforested still maintain large numbers of tropical species. Even small patches of trees can make a difference and help some species. But the flip side of the coin is, in the long term, most of these species are still declining."

## **The only way**

The seeds of this project were planted in 1996 when Sekercioglu, then an undergraduate at Harvard University, was studying the effects of logging on tropical bird communities in Uganda. "I wanted to continue that research in grad school," he says, "but I wanted something long term. Not just a quick snapshot, but a multiyear study where I could look at long-term population change."

Such long-term studies are rare, partially because of the research timeline of a typical graduate student. Doctoral students in biology may be able to collect four years of data before compiling their research into a dissertation to complete their degree. But Sekercioglu wanted more than four years. To get the long-term trends he wanted, he needed at least six years. Ten would be even better.

With the blessing of his doctoral advisory committee at Stanford

University, Sekercioglu set out for Costa Rica in 1999 for the first of 11 field seasons. Between 1999 and 2010, he and his team set up stations in both protected forests and in coffee plantations where he and colleagues would extend nearly invisible nets. The "mist nets" allowed the researchers to temporarily capture [birds](#) and affix an ankle band, or check for an existing band, before releasing the bird. Banding allows each bird to be individually identifiable—an essential element of fine-grained population surveys. "These are small, often secretive songbirds we're talking about," Sekercioglu says. "You need the bird banding. It's labor intensive, but there's really no substitute."

After earning his doctorate in 2003, Sekercioglu remained at Stanford, first as a postdoctoral scholar and then as a senior research scientist, to keep the Costa Rica project going. Over the years, with the support of his co-authors Gretchen Daily, Paul Ehrlich, Chase Mendenhall and Federico Oviedo-Brenes, he and his colleagues mist netted 57,307 birds from 265 species in 19 different study sites—all by hand. In 2009, after securing a position at the University of Utah, he wrapped up his field work in Costa Rica before moving to his current lab in Salt Lake City in 2010.

## **Diversity can be deceiving**

In Sekercioglu's new paper, he and his co-authors present their results. First, some definitions of the land types in the study:



Roadside Hawk. Credit: Cagan Sekercioglu/University of Utah

- Coffee plantations with less than 10% tree cover are referred to as "open coffee."
- Coffee plantations with 10% to 20% tree cover are called "shaded coffee" in the study. Sekercioglu points out that *shaded* coffee is not the same as certified shade coffee, which grows under a canopy of native primary forest trees.
- The other sites are collectively referred to as "forest" sites, though this encompasses fragmentary forests, narrow corridors of forest that run along rivers and protected forest land. The two protected areas are of vastly different sizes: The Las Cruces Forest Reserve has an area of 250 hectares—about one square mile. That's smaller than the University of Utah campus. La

Amistad International Park, on the other hand, has an area of 400,000 hectares—around 1,500 square miles, which is a little smaller than Rhode Island. That size difference is important.

The results of the study are a mix of **bad news** and **good news**. Let's start with some **bad news**.

Over the study period, 61% more bird populations declined as remained stable or grew, and this trend held in all study sites except those in the large La Amistad International Park. "If you really want to conserve the native tropical forest bird community," Sekercioglu says, "there's really no replacement for big forest reserves like La Amistad. You really need at least 1,000 hectares (3.86 square miles) native primary forest. So, there's no replacement for that."

Now some **good news**. Coffee plantations host nearly as many bird species as forests, with 230 species recorded in forest sites and 185 recorded in coffee sites.

But just looking at the number of species can hide some **bad news**—species richness isn't always descriptive of how diverse an ecosystem really is, or a habitat's value for conservation. "These plantations get spillover species from the nearby intact rainforest," Sekercioglu says. "That adds to the richness." Other species present in the coffee plantations include those that prefer open habitat as well as those who can inhabit a variety of habitats. "Their populations are not declining," he adds. "In fact, many have globally increasing populations. But a lot of the species missing from these coffee plantations are the most sensitive specialist species. Any study of the conservation value of a habitat has to look at the details of the community composition and not just the sheer number of species detected."

The coffee plantations redeem themselves, somewhat, with a little bit of



**good news** to end on. The researchers found that shaded plantations (again, not *shade* coffee, just *shaded*—to be clear) with an average of about 13% tree cover hosted double the number of forest specialist birds and half the number of open-habitat birds compared with plantations with only an average of 7% tree cover. In other words, a small increase in tree cover results in a significant increase in bird habitat.

Are shaded coffee plantations an answer to the threat of deforestation? "No" Sekercioglu says. "In the long term, by themselves, they are not enough to preserve tropical biodiversity. We need a combination of agricultural areas with as much [tree cover](#) as possible and extensive primary forest reserves."

## Painting a long-term picture

Despite the labor-intensive nature of a bird banding study and the relative rarity of such a long-term project, an undertaking like this is necessary to get a more accurate picture of bird population compositions and trends. "These days it would be very hard to do a study like this," Sekercioglu says. A "snapshot study" might have concluded, for example, that the number of bird species in the Las Cruces Forest Reserve indicated a healthy [forest](#), when in fact Sekercioglu's study found more than three-fifths of the bird species in decline.

"Short-term studies that focus just on species richness are likely to provide a rosier picture of the community health and the conservation status of these [species](#) than the reality," he says.

**More information:** Çağan H. Şekercioglu et al., "Long-term declines in bird populations in tropical agricultural countryside," *PNAS* (2019). [www.pnas.org/cgi/doi/10.1073/pnas.1802732116](http://www.pnas.org/cgi/doi/10.1073/pnas.1802732116)

Provided by University of Utah

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