**How Human Activity — and Extinctions — Are Driving Evolution**

By [Bryan Walsh](http://science.time.com/author/bryanrwalsh/)May 31, 2013

A toucenet eats palm fruits in the Atlantic rain forest. The birds play an important ecological role in dispersing palm seeds

We’re likely in the middle of a [mass-extinction wave](http://science.time.com/2013/05/13/why-a-hotter-world-will-mean-more-extinctions/), most of it likely because of human activity. For a species to go extinct is an intrinsic loss, if not exactly an unprecedented one. Ninety-nine percent of all the species that have ever existed on [earth](http://topics.time.com/earth/) [eventually went extinct](http://www.pbs.org/wgbh/evolution/change/deeptime/low_bandwidth.html) — but they’ve rarely died out as rapidly as they are today. It’s like [global warming](http://topics.time.com/global-warming/) — it’s not the simple fact that things are changing that is so worrying, it’s the speed. And as it turns out, the life on our planet can change very, very fast.

That’s the takeaway from a neat [new paper published](http://www.sciencemag.org/content/340/6136/1086.full) in the May 30 *Science*. Rain forests in the Brazilian Atlantic region became increasingly fragmented over the past century as settlers cleared land for agriculture or logging. As the forest broke up, numerous species were pushed into extinction or made increasingly endangered — including the channel-billed toucan, a tropical bird with a characteristically large bill (think Toucan Sam). The channel-billed toucans are frugivores — fruit eaters — that consume large-seeded fruits that smaller birds can’t handle. When they eat those fruits, they disperse seeds around the forest as they fly from tree to tree, helping to spread the very tree species they feed on. This is a healthy ecosystem at its best.

Or it would be, except that population levels of the toucan have fallen dramatically over the past century, thanks to hunting and deforestation. Bad for the birds, obviously. But what the Brazilian and Spanish researchers in the *Science* studyfound was that as the toucan disappeared, the forest around it changed. The palm trees that produced the fruit popular with the toucans adapted to the loss of the bird by producing fruit with smaller seeds — small enough for other birds to disperse. In short, the trees evolved.

But not exactly for the better. The new seeds produced by the palm trees in patchy, toucanless areas of rain forest were less fit, producing smaller and less vigorous seedlings than the larger seeds — which could be dispersed by the toucans — could have. This is the healthy ecosystem inverted — the loss of a species touches another, and even if the latter survives, it does so weakened and fragmented. It’s evolution in motion, but evolution fought as survival in a world that is changing too fast, as lead author Mauro Galetti from the Universidade Estadual Paulista in São Paulo put it in a statement:

Habitat loss and species extinction is causing drastic changes in the composition and structure of ecosystems, because critical ecological interactions are being lost. This involves the loss of key ecosystem functions that can determine evolutionary changes much faster than we anticipated. Our work highlights the importance of identifying these key functions to quickly diagnose the functional collapse of ecosystems.

Some 80% of the Atlantic rain forest biome has become fragmented, broken up by slash-and-burn agriculture and pastureland. You can see how one Brazilian state became deforested over the past 30 years at our [Timelapse page](http://world.time.com/timelapse/). Deforestation rates in the Amazon had slowed in recent years, but now they seem to be picking up again — even as [climate change](http://topics.time.com/climate-change/) and drought will only increase the stress on the rain forest. And the evolutionary experiment will keep playing out in front of us.