

## REPRODUCIBILITY

# Ecologists sow seeds of trust

*Multi-lab replication efforts point the way to shoring up the reliability of field studies.*

BY EWEN CALLAWAY

In an unusual reproducibility effort, 14 ecology labs across Europe have teamed up to watch grass grow, using identical soil and seeds shipped round the continent. Their study, posted on the bioRxiv preprint server on 8 August (A. Milcu *et al.* Preprint at bioRxiv <http://dx.doi.org/10.1101/080119>; 2017), is part of a budding movement to bolster trust in ecological research.

Following the reproducibility crisis that has gripped psychology and biomedical science, ecologists are starting to recognize that their own field might not be immune to doubts over the reliability of its findings. In May, Emilio Bruna, a plant ecologist at the University of Florida in Gainesville, circulated a proposal to replicate ten seminal experiments in tropical biology that have never been repeated.

But many ecologists are sceptical about repeating field experiments, Bruna says — arguing that the results of ecological field studies can never come out the same. A study conducted in a Panamanian forest, for example, may not translate to Costa Rica; even if the trees are the same species, herbivores may vary.

“There are people who say, ‘Every study is a snowflake. If you replicate my study and you don’t find the same results, it’s because conditions are changed and it’s meaningless,’” says Tim Parker, an ecologist at Whitman College in Walla Walla, Washington, who is working on a teaching module that would enlist undergraduates to help with replication efforts.

The objection holds even for replicating simplified model-ecosystem experiments conducted in the lab, says Alexandru Milcu, an ecologist who led the grass-growing study at the Ecotron in Montferrier-sur-Lez, France, run by the country’s basic-research agency, the CNRS. “We can try to standardize everything but we will never take into account all the variables that affect an experiment — some of which we don’t even know,” he says.



MICHAEL NICHOLS/NGC

Ecologists take samples from a giant redwood tree in California.

So Milcu’s suggestion, at least for lab work, is to make a virtue of including variation in experiments, which may make conclusions more robust. That idea is inspired by a 2010 mouse study, which found that behavioural tests yielded fewer spurious results when factors such as the age of the mice or the size of their cages were deliberately varied (S. H. Richter *et al. Nature Meth.* 7, 167–168; 2010).

Milcu and his colleagues examined the tenet that grass grows better when it is paired with legumes (which snatch nitrogen from the atmosphere and enhance soils) — a widely supported theory that is the basis for crop rotation using leguminous plants such as clover. In one set of experiments, the 14 labs controlled every variable as best they could; in the second set, they deliberately planted mixed strains of grass in varying soil conditions. The study, which has not yet been peer reviewed, finds that labs were more likely to come to similar conclusions about the benefits of growing grasses and legumes

together in the less-controlled experiments. By making each lab’s data noisier, a robust effect generalizable across many conditions is more likely to stand out, Milcu says. The strategy could lead to ecologists missing small but significant local effects in particular systems, he acknowledges — but he says that this could be remedied by doing larger experiments. How the idea could be translated to field work isn’t clear, although Milcu thinks it is worth exploring.

Bruna thinks that ecology’s resistance to replication studies comes from a misunderstanding over their goals, as well as their consequences for ecological theory. Replication studies needn’t be perfect facsimiles to be useful, he says: just because an effect observed in one tropical ecosystem doesn’t seem to hold true in another does not mean the original study was wrong. “In ecology we want to explore why there is so much variance,” Bruna says. “No pun intended here, but people don’t seem to be able to see the forest for the trees.” ■



**MORE  
ONLINE**

BALÁZS G. MENDE, LAB,  
ARCHAEOGENETICS, RICH HAS

## TOP NEWS



Archaeologists say labs hoard ancient DNA in a cut-throat ‘game of bones’ [go.nature.com/2w9km85](http://go.nature.com/2w9km85)

## MORE NEWS

- Australian ecologists decry plans to cut environment-monitoring network [go.nature.com/2uxsowt](http://go.nature.com/2uxsowt)
- AI identifies plant species for science [go.nature.com/2vewldq](http://go.nature.com/2vewldq)
- Sea snakes lose their stripes to deal with pollution [go.nature.com/2fjkhsv](http://go.nature.com/2fjkhsv)

## NATURE PODCAST



Preventing genetic diseases in China, a red supergiant star’s mystery, and a huge algal bloom [nature.com/nature/podcast](http://nature.com/nature/podcast)