

DNA found in lake bottom offers historical clues regarding impact of an invasive species

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A team of researchers from France, Italy and Norway has found a natural historical record of the impact of an invasive species of rabbit on a remote Indian Ocean island. In their paper published on the open access site *Science Advances*, the researchers describe their efforts to learn more about the environmental impact of an invasive species.

The researchers note that understanding the full [impact](#) of an invasive [species](#) on an environment is difficult, involving many factors, one of which is generally a long timescale. In this new effort, the researchers

found an environment with few interacting variables and a natural historical record—DNA found in a lake bottom.

The environment was the Kerguelen Islands, situated in a remote southern part of the Indian Ocean. The invasive species was a type of [rabbit](#) introduced to the islands as a food source in 1874 by a group of scientists—they were there to study the transit of Venus, but they left behind several rabbits that quickly multiplied because there were no predators. Since that time, the rabbits have spread across much of the main island of Grande Terre, wreaking havoc on the delicate ecosystem.

To learn more about the impact the rabbits have on the island, the researchers collected samples from the bottom of a lake which contained samples of plant DNA. They found samples dating back several hundred years, and were able to follow the events that had transpired.

They deduced that the region had been relatively stable for hundreds of years prior to the arrival of the rabbits. Then, in the early 1940s, when the rabbits made their way to that part of the island, things changed. Prior to their arrival, the dominant plant was *Azorella selago*—after their arrival, plant diversity plummeted. They also noted that erosion dramatically increased, as well.

The team notes that erosion did eventually level off, but the ecosystem was unstable, and remains that way today in spite of efforts to eradicate the rabbits by the French Government. Instead, due to more human traffic in the area, other invasive species have made their way to the [islands](#). Still, the island offers a unique opportunity to study the impact of an [invasive species](#) in a near-pristine environment.

More information: Gentile Francesco Ficetola et al. DNA from lake sediments reveals long-term ecosystem changes after a biological invasion, *Science Advances* (2018). [DOI: 10.1126/sciadv.aar4292](https://doi.org/10.1126/sciadv.aar4292)

Abstract

What are the long-term consequences of invasive species? After invasion, how long do ecosystems require to reach a new equilibrium? Answering these questions requires long-term, high-resolution data that are vanishingly rare. We combined the analysis of environmental DNA extracted from a lake sediment core, coprophilous fungi, and sedimentological analyses to reconstruct 600 years of ecosystem dynamics on a sub-Antarctic island and to identify the impact of invasive rabbits. Plant communities remained stable from AD 1400 until the 1940s, when the DNA of invasive rabbits was detected in sediments. Rabbit detection corresponded to abrupt changes of plant communities, with a continuous decline of a dominant plant species. Furthermore, erosion rate abruptly increased with rabbit abundance. Rabbit impacts were very fast and were stronger than the effects of climate change during the 20th century. Lake sediments can allow an integrated temporal analysis of ecosystems, revealing the impact of invasive species over time and improving our understanding of underlying mechanisms.

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