See how humans have redrawn Earth's biological map

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Humans are rapidly changing the distinctive biodiversity that evolved in regions of the Earth over millions of years by introducing new species and wiping out others, a new study has shown.

An international team of scientists looked for the first time at how invasive species and extinctions caused by human action have altered the balance of species across whole regions and even worldwide. As well as bringing species like rats and rabbits to new countries, humans have triggered local and global extinctions by destroying habitats and building infrastructure like roads that stop wildlife from moving around the landscape.

The study, published today in *Ecology Letters*, challenges the assumption that the biological makeup of regions of Earth are robust, and demonstrates that even the ecology of vast areas is vulnerable to being affected by humans over relatively short time periods.

Dr. Manuela González-Suárez, ecologist at the University of Reading and co-author of the study, said: "Introducing new species or causing others to go extinct in areas defined by the animals that live there can have a devastating impact that extends far beyond that region.

"This study shows the importance of preserving the unique and delicate balance of biodiversity which has been established in regions of the world over millions of years giving them their identity. It can take as little as a decade for human activity to tear up millions of years of

evolution. We are not just losing some species we love, we are changing the global maps."

The research team used statistical models to reveal how the distribution of species of mammals, birds and amphibians in different regions of the world has been affected by the introduction of invasive species and could be affected by future extinctions, as well as a combination of both.

Ruben Bernardo-Madrid, a researcher at EBD-CSIC in Spain and lead author of the study, said: "We can define areas of the planet based on these patterns of biodiversity, based on the different groups of species that occupy them. We call these areas bioregions and up to now we thought these were shaped over thousands or millions of years, and had not been disrupted by human activities. Our study shows we thought wrong."

"The results are alarming because they show human activities can meddle with the historical, ecological, and evolutionary signal that we use to understand the processes that have shaped life on Earth."

The changes taken into account by this study include the introductions of species like the black rat, which originated in Asia but is now widespread in Europe and Africa after stowing away with humans as they sailed around the world hundreds of years ago.

Rabbits, once native to south west Europe and north Africa, and now common in the UK and the rest of Europe, as well as South America, Australia and New Zealand where they have caused widespread damage to crops and brought about costly measures to attempt to prevent them from spreading.

The well-known case of the cane toad has also caused widespread damage in Australia after being introduced from America in 1935 in an

attempt to control the native grey-backed cane beetle.

More information: Rubén Bernardo-Madrid et al. Human activity is altering the world's zoogeographical regions, *Ecology Letters* (2019). DOI: 10.1111/ele.13321

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