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Press release

Conservation biology

A study by the CSIC suggests using electricity grids to increase biodiversity and connect fragmented fauna

- The report points out the enormous potential of the electricity transmission grid as an ecological corridor for small-scale fauna, since modifying the base of high-voltage towers can increase local biodiversity and connect fragmented populations
- The study aims to mitigate the effects of anthropogenic climate change, which is already affecting ecological systems and the distribution of biodiversity, as well as influencing 80% of all biological processes

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A team from the Doñana Biological Station (EBD) of the Spanish National Scientific Research Council (CSIC), led by head researcher Miguel Ferrer, has carried out an experiment to determine whether the bases of electricity transmission line towers could be transformed into biodiversity reserves for small animals.

The study assumes that the most common ecological response to climate change is changes in the distribution of species. However, the fragmentation of the landscape compromises the limited dispersal capacity of species. Enabling such movements by building connected environments that allow species to track climate change is one of the main challenges of conservation biology.

"We analysed whether the management of the habitat located within the base of the power line supports (with an area of 100 m2 where shelter was provided and native bushes were planted) made it possible to increase local species richness, we were able to increase the density and diversity of several invertebrate and small mammal species, as well as the number of birds and bird species, thus increasing local biodiversity," Ferrer stated. Along these lines, he adds: "We suggested that modifying the base of electric towers would potentially facilitate the connection of populations. This idea would be easily applicable to any transmission line grid anywhere in the world, making it possible to build connectivity grids on a continental scale for the first time".

The study, entitled "Transporting Biodiversity Using Transmission Power Lines as Stepping-Stones" and published in the " Diversity " magazine, is financed by Red Eléctrica de España (REE), and features the participation of the Applied Ecology Group of the EBD/CSIC (composed of Miguel Ferrer, Manuela De Lucas and Elena Hinojosa) and the Oregon Fish and Wildlife Cooperative Research Unit of the Department of Fish and Wildlife, Oregon State University, Corvallis (with Virginia Morandini).

According to the scientific publication, "building connected environments that allow species to keep pace with changes in climate, decreasing the risk of extinction for many of them, is the most repeated suggestion for adapting our conservation strategies". Miguel Ferrer adds that "this system would improve connectivity,

gabinetedeprensa@ree.es
Tel. 91 453 33 33 / 32 81 - 91 728 62 17
www.ree.es > Press office
http://entrelineas.ree.es/

by providing a network of corridor habitats or springboard patches which is, today, a key concept in conservation and landscape biology".

For the Manager of Sustainability Area at Red Eléctrica, Antonio Calvo, "turning power lines into biodiversity corridors is an opportunity to combat the fragmentation of habitats, one of the contemporary ecological problems affecting all species". Calvo highlights the importance of this study, "which encourages us to place our infrastructures at the service of biodiversity, which will help us to achieve our 2030 objective of having a positive environmental impact on the surroundings of our facilities".

An international network of corridors

The article explains that the safe transmission of electrical energy requires a large number of interconnected lines, which facilitate the transmission of energy from generation points to consumption points. This set of lines and substations (nodes connecting several lines), are known as the transmission grid. This grid is mainly made up of overhead power lines, supported by transmission towers, which generates a huge network of connected lines that cover almost the entire territory in developed countries.

"Normally, these supports are placed at a distance of about 200-400 metres from each other and with a base of 10 by 10 m (100 m2) on average. Today, Europe has a transmission grid of about 500,000 km of overhead lines and the United States about 254,000 km, which means 2.5 million and 1.27 million supports, respectively. Consequently, we have a large area under the towers that we can potentially use to connect populations of species with limited dispersal capacity in fragmented landscapes," concludes Miguel Ferrer.

Figure 1. Schematic representation of the transmission grid (220-999 kV) in the European Union. The image highlights the intensiveness with which this area is interconnected through transmission lines

According to the scientific publication, in Spain alone, where the transmission grid covers 44,000 km, 15 percent of the transmission towers are within the EU's Natura 2000 network (Figure 2), which connects practically every protected natural area in the Iberian Peninsula.

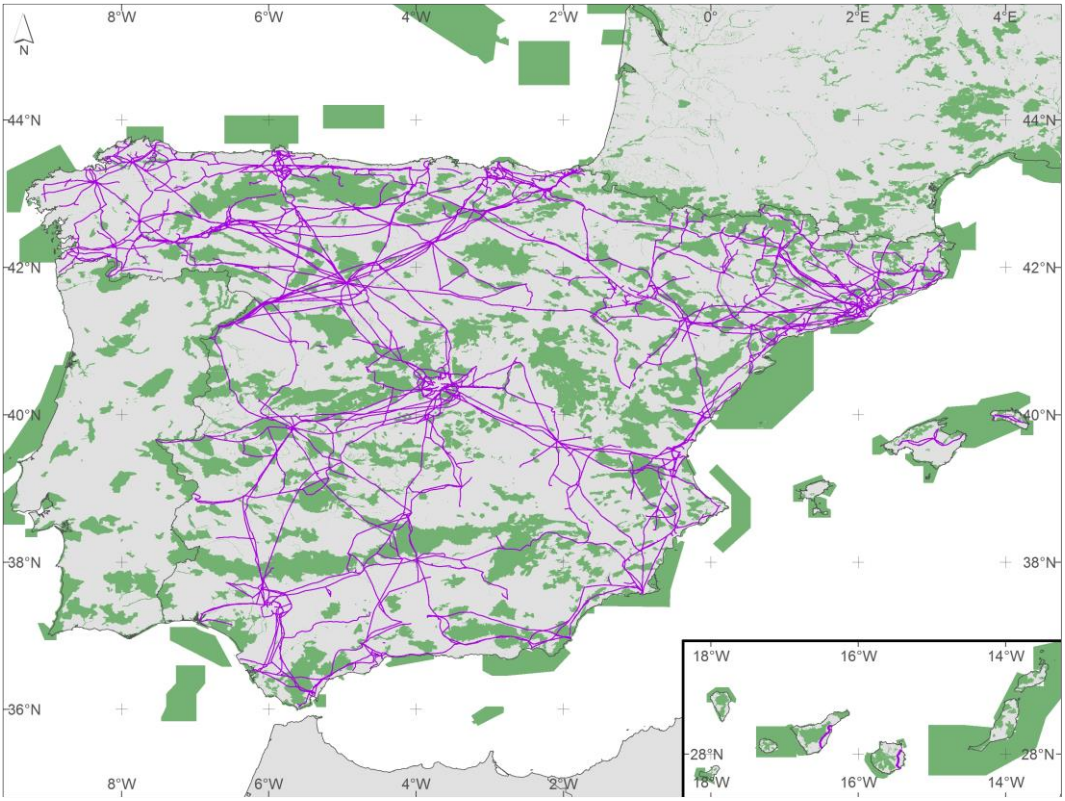

Figure 2. Spanish transmission grid. Protected natural areas within the European Union's Natura 2000 network are represented in green. The black circle indicates the location of the Study on the power lines. This image shows how the transmission lines potentially connect most of the protected natural areas.

Study and experimental phase

For the experiment, the research team selected two 400 kV parallel transmission lines located in Andalusia (in the provinces of Córdoba and Jaén), called the 400 kV Cabra-Guadalquivir Medio line and the 400 kV Guadalquivir Medio-Tajo de la Encantada line (Figure 2). The area is mainly made up of artificial steppes, occupied by dry cereal crops, with some areas having a scattering of olive trees and bushes, with a typical Mediterranean climate characterised by hot, dry summers.

"We selected a 27 km stretch of both lines that crossed a large area of cereal steppes. Within these lines, we selected six supports (three on each of the parallel transmission lines), to manage the habitat located within the base of the towers", explains Ferrer.

"The management measures included the provision of refuges for small mammals and invertebrates, with medium to large stones, and within the base of these selected towers, we planted native bush seedlings.

We only used the interior of the base for bush plants because the surrounding area was used intensively for dry cereal crops. The shrub species were selected because of their native origin and their ability to support local invertebrate communities. We protected the new plants from herbivores with a mesh at the perimeter of the tower base. We provided irrigation for the first four months and the survival of the plants was almost 100 percent. Additionally, we selected four control sites. In total, 800 samples were taken to determine the presence of invertebrates, using eight pit-fall traps. In addition, a census of the birds observed was carried out. "For four years we trapped small mammals, arthropods and observed birds in modified and control towers, in two electric lines that cross dry cereal crops, a barrier for the dispersion of several species", explains the researcher at the Doñana Biological Station.

In conclusion, during the study period 163 micromammals belonging to four species and 313 invertebrates of eight different orders were captured. Specifically, according to the publication, the modifications implemented in the base of the towers made a significant impact, with ten times more small mammal individuals in the modified tower bases being found than in other control sites.

Likewise, highly significant effects of the treatment, the weather and its interactions were again found, with the number of birds observed being 7.5 times higher in the modified towers than in the control ones. These differences follow the same pattern as those observed in invertebrates. "Our experiment demonstrated that, by modifying the base of the towers, we were able to increase the density and diversity of several species of invertebrates and small mammals and, probably in response to that, also the number of other species and birds", states Miguel Ferrer.

AUTHORS:

Miguel Ferrer 1, *, Manuela De Lucas 1, Elena Hinojosa 1 and Virginia Morandini 2

1 Grupo de Ecología Aplicada, Estación Biológica de Doñana (CSIC), Avd. Américo Vespucio s / 41092 Sevilla, España; manuela@ebd.csic.es (M.D.L.); elenahinojosa@gmail.com (E.H.)

2 Oregon Fish and Wildlife Cooperative Research Unit, Department of Fish and Wildlife, Oregon State University, Corvallis, OR 97331, USA.