

European network of protected areas has not yet been able to stop the decline of butterflies in Germany

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The Scarce Copper (*Lycaena virgaureae*) and the Sooty Copper (*Lycaena tityrus*). Credit: Petra Druschky, Wandlitz

The Natura 2000 network of protected areas runs across the EU as a

conservation network for biodiversity. However, only a few studies have so far analysed whether these refuges actually have a positive effect on species diversity. Studies have predominately focussed on birds and have not shown any clear trends. Using long-term data from the "Butterfly Monitoring Germany" citizens' research project, scientists from the Helmholtz Centre for Environmental Research (UFZ) in Halle, Germany, and the Palacký University Olomouc, Czech Republic, have now investigated the matter using butterflies as an example. According to the research, there are more butterfly species in Natura 2000 areas than elsewhere. However, in the journal *Diversity and Distributions* the researchers reported the same decline in the numbers of species regardless whether the communities are located within or outside the protected areas.

The idea in itself is sound: A mosaic of protected forests, grasslands, lakes, rivers and other habitats designed to provide shelter for Europe's endangered plants and animals. The EU has been developing this Natura 2000 network of protected areas since 1992. It now covers over 18 percent of the EU's land surface and is one of the most important building blocks for European nature conservation. But the question remains how effective this network actually is. Can it indeed stop the rampant loss of species? A [research team](#) led by Martin Musche from the Helmholtz Centre for Environmental Research (UFZ) in Halle investigated this question using butterflies as an example.

It is no coincidence that the researchers used this species group for their analysis. On the one hand, there are numerous butterflies with particular habitat requirements and are therefore representative for many other species. Consequently, they are regarded as highly suitable indicators for the conditions of a landscape. What is more, they also play an important role in the ecosystem as pollinators, herbivores, and as a food source for birds and other animals.

Above all, the occurrence of butterflies is relatively well investigated. They are conspicuous insects, many of which are easy to identify, even for laypersons. The UFZ is therefore coordinating a citizens' science project called "Butterfly Monitoring Germany" since 2005, where all interested parties are able to participate. Between April and September, participants all over Germany gather information about the occurrence and abundance of the species. Week after week, every participant walks pre-determined routes (which are called "transects") up to one kilometre in length, noting all the active butterflies they see along the way. "Over 500 people are now participating nationwide," explains UFZ biologist Elisabeth Kühn, who is coordinating the monitoring project. Many new participants registered to take part last summer in particular. Headlines about insect decline have probably shaken many nature lovers who now want to contribute to investigate this phenomenon. "As part of this discussion, we are always asked for more information about the occurrence of insects in Germany," says Elisabeth Kühn. "We already have some great data on butterflies." Observers have been active on around 300 counting routes for at least eight years, thus researchers are able to calculate initial trends from the data gathered so far.

As part of the Natura 2000 check, the researchers have chosen 245 of these routes that have been monitored particularly regularly. These transects are spread across Germany, with around 28 percent located within Natura 2000 areas. The scientists were used statistical methods to analyse whether the conservation status of their habitat made a difference to trends in species richness of local communities comprised of 122 butterfly species recorded in total.

At first glance, the efficiency of Natura 2000 sites seems positive. On the routes outside the protected areas, butterfly investigators counted an average of 18 species, while the figure rose to 21 species within the protection areas. "This is not necessarily because the habitats in the Natura 2000 might generally be more suitable for butterflies," explains

Elisabeth Kühn. "Also, they are probably in a better shape." And this is not only noticeable in the protected area itself, but also in its surroundings. The closer a transect is to such a refuge, the higher its number of species. It might well be that these habitats act as butterfly sources, from which the insects flutter into the surrounding countryside. And in many cases, the actual protected areas are only the most valuable areas in an overall diverse landscape.

All this sounds like some thoroughly positive findings. "In fact, these results suggest that the Natura 2000 sites have been well chosen," says Elisabeth Kühn. They do indeed appear to protect a good cross-section of particularly valuable areas.

However, the verdict on the ecological rescue network is not entirely pleasing. The researchers also analysed how butterfly populations have changed between 2005 and 2015. According to the results, at the beginning of this period, an average of more than 19 species fluttered over the transects, but by the end of the period this number had fallen to 17. "This is a significant decline of around ten percent," says Elisabeth Kühn. "And this was observed both inside and outside the protected areas." The Natura 2000 network does not yet appear to have had any effect – at least in the case of butterflies – on its actual task of halting species decline.

Using further analyses, the researchers now hope to find out why. They believe that this could be due to large-scale effects, such as [climate change](#) or changes in [land use](#), which affect the entire landscape, irrespective of conservation status. But it could also be that the cause lies in the protected areas themselves. The vast majority of these areas are cultural landscapes that cannot be completely left to their own devices. Nutrient-poor grasslands, for example, should be regularly mown or grazed. Otherwise, shrubs spread there over time and open-land species lose their habitat. However, such management can be structured

differently. And this may be where the problem lies. "So far, these measures have often been geared to the needs of other groups, such as birds," explains Elisabeth Kühn. "And butterflies do not necessarily benefit from this." For example, mowing times of many grasslands are not adapted to the development of butterfly caterpillars, where the requirements can vary greatly from species to species.

"We can only resolve such conflicting goals if we look more closely at individual [species](#) and habitats," says Elisabeth Kühn. She and her colleagues hope that their wealth of data will also make this possible and they can derive ideas on how nature conservation [areas](#) can be managed even more effectively than before.

More information: Stanislav Rada et al. Protected areas do not mitigate biodiversity declines: A case study on butterflies, *Diversity and Distributions* (2018). [DOI: 10.1111/ddi.12854](https://doi.org/10.1111/ddi.12854)

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