



Press Release State Museum of Natural History Stuttgart

Temporal changes in the Swiss flora - implications for flower-visiting insects

Conservation measures to date do not measurably increase biodiversity of native plants with specialized pollination biology. Ecological studies put positive biodiversity trend in Swiss flora into perspective. The study provides indications for conservation measures in Central Europe.

Stuttgart, 30.09.2022. Habitat loss has led to a drastic decline in plant biodiversity in large parts of Europe, as well as to massive changes in the composition of species communities. However, studies in individual regions of Central Europe indicate that this trend has been regionally halted or even reversed since the late 1990s due to conservation measures. Until now, it was unclear whether this development could be observed equally in different plant groups. A German-Swiss team of scientists from the Universities of Bonn, Zurich and Basel and the Natural History Museum in Stuttgart have analyzed the changes in the Swiss flora since 2002. The results of the study show that generalists among plant species have increased again due to conservation efforts. Specialized plants and insects, however, have not measurably benefitted from this. The scientists' findings may help in future renaturation planning in Central Europe. The publication appeared in the journal BMC Ecology and Evolution.

Sharp decline in biodiversity of native plants

Intensification of agriculture and increasing land consumption due to the expansion of settlements, industrial estates and infrastructure, and climate change have led to a severe impoverishment of flora since the beginning of the 20th century. This diversity decline was most pronounced before the 1990s. Since then, changes in conservation policy have slowed down and even reversed the decline in species richness for some groups at smaller spatial scales. However, the homogenisation of plant communities often continued. The rebound in species numbers is mostly due to widespread species and neophytes, introduced plants that may spread due to climate change, among other factors.

Generalists and specialists benefit differently from conservation measures

It was previously unclear whether plants pollinated by generalist insects or the wind have increased as much as plants adapted to specialized pollinators, such as bumblebees or butterflies. In addition, it was unknown whether plants that rely on pollen from other individuals of the same species for seed production have increased as much as plants that can form seeds with their own pollen.

"In our studies of the Swiss flora, we found that there are positive developments across all species groups. However, this development is much more pronounced for species that are pollinated by wind and not by insects. Within insect-pollinated plant species, species that are pollinated by generalist insects, such as flies or short-tongued bees, benefitted more than species that rely on specialized pollinators. These include bumblebees and long-tongued wild bees.



Likewise, plant species that do not rely on pollen from another individual of their own species recovered better than plants that are cross-pollinated. Specialists, on the other hand, hardly benefitted at all," says Dr. Stefan Abrahamczyk, a botanist at the Natural History Museum in Stuttgart. The expert in pollination biology had begun work on the study at the University of Bonn in 2021.

Hints for future nature conservation measures

This finding can also be applied to insects, which depend on specific, highly specialized food plants in their search for nectar and pollen. As far as pollinators are concerned, Europe has experienced a much-publicized collapse of insect populations in recent decades. In particular, insect species with specialized breeding or feeding behaviour, including many long-tongued species, have declined dramatically.

From a conservation perspective, these study results demonstrate that future conservation and restoration planning should consider the reproductive biological characteristics of habitat-typical plant species. Conservation actions should be selected to benefit specialized plants. If these points are considered in planning, specialized native plants and insects can recover in the future.

For the editors

Original publication:

Abrahamczyk S., Roth T., Kessler M., Heer N. 2022 Temporal changes in the Swiss flora - implications for flower-visiting insects. BMC Ecology & Evolution 22: 109.

BMC Ecology and Evolution, DOI: <https://doi.org/10.1186/s12862-022-02061-2>
Published 09/15/2022.

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Image material:

Image 1: Bild1_Dr. Stefan Abrahamczyk bei der Geländearbeit_Bild, E.Abrahamczyk.jpg

Description: Botanist Dr. Stefan Abrahamczyk doing field work.

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Image 2: Bild2_Heracleum sphondylium_Wiesenbärenklau_Bild, SMNS, S.Abrahamczyk.jpg

Description: *Heracleum sphondylium* is a common species and has a generalized pollination biology.

Photo/Copyright: SMNS, S. Abrahamczyk



Image 3: Bild3_Lathyrus latifolius_Breitblättrige Platterbse_Bild, SMNS, S.Abrahamczyk.jpg

Description: *Lathyrus latifolius* is a species with complex flowers that can be pollinated only by large bees and bumblebees.

Photo/Copyright: SMNS, S. Abrahamczyk

Image 4: Bild4_Wildbiene_Andrena hattorfiana_Knautien-Sandbiene_Bild, M.Moser.jpg

Description: *Andrena hattorfiana* is a specialized wild bee. The species is classified as endangered in the Red List of wild bees of Germany.

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