**Press Release**
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Max-Planck-Institut
für Biogeochemie

# Greater biodiversity in grasslands leads to higher levels of ecosystem services

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**The more it swarms, crawls and flies the better for humans, who benefit from the varied services provided for free by nature. This is the finding of a study by more than 60 researchers from a number of universities, including scientists from the Max Planck Institute for Biogeochemistry in Jena, Germany. A diverse ecosystem populated by many species from all levels of the food chain provides higher levels of ecosystem services, the team reports today in "Nature". Even rather unpopular insects and invisible soil-dwelling organisms are important in maintaining a wide range of ecosystem services. The results underline the necessity of maintaining species-rich ecosystems for the good of humanity.**

That we humans are driving species all over the planet towards extinction is no news. However, much less is known about the possible consequences of this species loss for our own well-being. Natural ecosystems are complex and composed of many interacting species that belong to different trophic levels (carnivores, herbivores, etc.). The different trophic groups that constitute natural ecosystems may play different, but complementary roles, in providing the services we obtain from nature. These so-called ecosystem services include the provision of food or clean water, the protection from floods or insect pests, or the capture of the greenhouse gases that we release to the atmosphere. For example, livestock herbivores are excellent food providers, but not that efficient in capturing greenhouse gases Grasslands full of flowers are not only beautiful they also provide many important services for humans. These include food production, alongside supporting services such as soil development, regulating services such as pest control and climate regulation and cultural services such as the use of the grassland for recreation. Grassland is also a complex ecosystem containing many species belonging to different levels in the food chain, so called "trophic levels".

Humans are causing declines in biodiversity for many of these groups and evidence from experiments on plants suggests this might threaten ecosystem services. However, studies had not looked at diversity at many trophic levels at the same time.

A 60-strong research team, led by Dr. Santiago Soliveres from the University of Bern, therefore studied all groups in a grassland food chain for the first time. They collected data on a total of 4600 species of animal and plant from nine trophic groups, including often neglected ones such as microorganisms in the soil and insects that live in the soil or on the plants. The data was collected as part of a programme supported by the Deutsche Forschungsgemeinschaft (DFG) in 150 grasslands across Germany, the 'Biodiversity Exploratories', which constitute the most extensive ecological sampling in Europe.

**Biodiversity required within all trophic groups**

"Working out how different groups affect ecosystem services is like trying to solve a very complicated puzzle but with our extensive data we are able to put together a coherent picture of how important individual groups are for fourteen ecosystem services. Each ecosystem service is dependent on at least three groups and the higher the number of species within the group, the more reliably the ecosystem service is provided. In addition, each individual group influences at least one ecosystem service," Soliveres, lead author for the study, summarises the results.

Dr. Eric Allan from the University of Bern adds: "Many different groups are important for providing essential ecosystem services. In order for nature to continue 'working' reliably for us we therefore need to protect biodiversity at all levels in the food chain, including in often overlooked groups such as microbes or insects, which are generally not considered in conservation." Also, not always the same organism group is important for individual ecosystem functions. "While for example the diversity of plants and insects drives the amount of root biomass, soil organisms are especially important for soil carbon storage." explains Dr. Ingo Schöning from the Max Planck Institute for Biogeochemistry.

Another finding of the study was that the effect of biodiversity on ecosystem services is as strong as, or even stronger than, the effect of environmental conditions, fertilization, or other interventions we carry out to precisely maximize single ecosystem services. "Particularly when analyzing soils we often tend to ignore how important the role of the many different groups of organisms is for carbon and nutrient cycling." affirms Dr. Marion Schrumpf from the Max Planck Institute for Biogeochemistry. Often, fertiliser is applied to the soil in order to increase soil fertility and thus increase plant growth. Fertilisers help in the short term, but if biodiversity is reduced, then the downsides outweigh this. Maintaining high levels of biodiversity throughout the food chain is therefore more economical and wiser in the long term than destroying it for short term gains.

**The importance of biological diversity for ecosystem services has been underestimated**

"If biodiversity is rapidly destroyed, what consequences does this have for humans? What courses of action are available? Thus far, there has been insufficient research into this, which is one of the reasons why the international biodiversity council IPBES was founded," explains Prof. Markus Fischer from the Institute of Plant Science at the University of Bern and head of the Biodiversity Exploratories project. This study also shows that the importance of biological diversity has been underestimated because previous research only focused on individual trophic groups: "Our extensive research programme demonstrates how important it is to study the broader context and that there is a need for action to protect ecosystems," summarises Fischer.

Original publication

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Soil sampling on a managed grassland (http://www.biodiversity-exploratories.de/startseite/) ©Alicia Geppert