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# About the SCALES project with David Storch

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19. 4. 2011, By: Marie Kohoutová, Translation: Jaroslav Švelch

David Storch's work at the Center for Theoretical Study focuses on macroecology and evolutionary ecology. He is currently involved in two projects investigating the processes that determine natural diversity.

**What can a lay person image under the title "SCALES - Securing the Conservation of biodiversity across Administrative Levels and spatial, temporal and Ecological Scales"?**

It's quite difficult to describe, even for me. The most important part is the abbreviation SCALES, which is also the key concept.

**Are the two projects you are working on somehow related?**

To a certain extent, yes. The other one is a regular Grant Agency of the Czech Republic project. They focus on similar topics. We are interested in biological diversity in various, mostly spatial scales, whereas the European project focuses much more on the scales themselves and on what happens when the scales change. European projects such as DAISIE, in which Professor Pyšek and Professor Jarošík take part, tend to be useful for environmental policy – for particular environmental measures. The SCALES project has similar aims, while the Grant Agency one is much more theoretical.



**Doc. Dr. David Storch, Ph.D., CTS UK**

**So the SCALES project is concerned with spatial scales?**

Pretty much so – that's the idea of the people who proposed this project, myself included. 28 institutions from EU countries take part in it and EU also provides the funding. Protection and conservation of the environment tends to be very local and usually takes place on the level of individual environmental protection areas or reservations, but the important things in nature happen on different levels in different scales, including the larger ones, for example the shifts in ranges of certain species, climate changes and so on; these take place on the scale of whole continents. Our aim is then to integrate our knowledge of what we call macroecology phenomena with the things that happen and that we can do in smaller scales. That's where the name comes from.

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**What if we change the scale from the local one to one that covers large regions? How does the data change?**

Data doesn't really change, because it is always tied to a certain scale. It's more complex. I'll give you an example. Typically, we protect those species that are rare in the Czech Republic. But they can be rare for various reasons. One of the might be that this is a periphery of their range; its centre might be further east and that's where they are abundant.

Therefore we protect them, only because we are on the westernmost outskirts of their range. And this is important to know, in order to take further measures. Another thing that is interesting in terms of scales is the permeability of the landscape. On the one hand, we can protect certain species in a certain area, but on the other hand, if their numbers grow, because we're protecting them, is the landscape permeable enough, so that can they spread throughout Europe? That's something we cannot deal with on the local level. We have to know about their distribution in whole Europe. We can explain the distribution of organisms either by environment (if it is suitable, the species can be found there) or by the dynamics of expansion – it can be that they started expanding somewhere else and they will eventually reach us, or they might be subsiding from the whole range. We cannot understand this without knowing what's going on the European scale.

**When the project comes to a conclusion, will it change which ways of protecting the landscape we find effective?**

The project has only just started and we don't know where it will lead us. Of course, in the course of the project, better databases and a more sophisticated system of data structures that will inform us about the state of the nature of Europe and about the factors that make it different in one place than it is somewhere else. The project will contribute to our knowledge of the diversity of the nature and its variation in different scales. However, it is hard to predict how much it can contribute to a more effective protection or a better management of biodiversity. We've only been through the first round of partial evaluation, we've handed in partial reports, gathered some data and performed first analyses. Our team is actually not involved in the stages related to environmental policy. That means that we mostly do theoretical research and provide tools for other teams.

**Which instruments of environmental policy are more effective – the support of a more considerate and modest way of life, more environment-friendly technologies in the industry, or economic and legal measures such as fines or financial support of environment protection projects? Or is the resultant state of the nature something that lies outside of the human influence?**

I don't think it lies outside, but many environment-friendly technologies, including lower CO<sub>2</sub> emissions, are supposed to make our environment cleaner or to prevent climate change. I'm not sure this actually works – but in any case it doesn't really protect the nature. Of course it makes sense to desulphurize power plants, but mostly for our benefit, because sulphur makes people sick. Cleaner technologies are generally aimed at improving the environment for humans rather than protecting nature, or wildlife, for instance. As for wildlife protection, I believe that administrative measures are the most effective means of protection. Creating a new environmental protection area or a national park is such a measure, because it entails a set of rules that we can rely on. There must be a legal framework that allows us to set up new environmental protection areas, bird protection areas or other areas somehow important for wildlife, including migration areas. These policy measures are a way of actually "doing" environmental protection, for example by choosing and promoting the right way of managing these areas by prohibiting certain activities that would destroy them. You mentioned modesty – that's always useful, but the effect of being modest and considerate is not immediate; it should help in the long run, but we cannot say that "thanks to people being more modest, the sparrow population is again on the rise. It's not that simple.

**Then what do you think is the most important step in protecting biodiversity? What helps it?**

That's an intriguing question. It's rather the other way around. We must determine what biodiversity is most threatened by. We can help it by limiting the things that threaten it.

**And what are these things?**

Among the factors that endanger current European biodiversity (and the same can be said about the whole Northern hemisphere), are the changes in scales of the landscape mosaic. The scale, in which important environmental processes take place in, has grown dramatically. A trivial example: Where there used to be small fields, we can now see huge expanses of agricultural land. We could say that this started happening in the 1950s, but it has in fact been a continuous process. A typical European landscape used to be a mosaic of fields and forests and bushes. But it has changed – where the fields were slightly prevalent, the minority biotopes disappeared and have been replaced by homogenous expanses of fields. And conversely, the places with more forests have become overgrown with forest, so again, the minority biotopes with lower granularity have disappeared. The landscape is becoming more homogenous in certain scales – more forests make for even more forests, more fields make for even more fields. This is related to the general shifts to larger scales, to the intensification of agriculture. Humans used to farm everywhere, but only made slight changes, whereas now they farm intensively in some places and other places are becoming overgrown. (That's why in some reservations and environmental protection areas, old-fashioned ways of landscape management are being simulated, like for example hand mowing.) For me, this is the most characteristic problem of today's nature. It is either becoming overgrown or agriculturally exploited. Peripheral habitats such as meadows and bushes are disappearing, because they are not considered "useful".

At the same time, the landscape is becoming eutrophicated. Due to the use of artificial fertilizers and other things, there is a lot of nutrients in it, which leads to the prevalence of nitrophilous species, such as the stinging nettle. It is even pronounced in the case of freshwater. Ponds are incredibly polluted and eutrophicated, but the fishing industry prefers it this way – it maximizes carp production. Most animals don't survive this pollution, only the carps do and that's what's important.

**What is your team's role in the SCALES project?**

It's rather theoretical. We focus on two things: Firstly, we analyze data about distribution of different groups of organisms from all over Europe, focusing on the factors affecting diversity – whether it's the climate or the landscape type or the spatial arrangement of the landscape. Secondly, we do theoretical research, examining models, tools and approaches

that could help us predict larger scale diversity from smaller scale samples. The idea is that if we have some smaller samples from different places, we can estimate the number of species in the whole country or in Europe. It could also help us see the more general processes and say something about the changes in the nature of Europe. We aim to create the theoretical tools for such predictions.

**doc. Dr. David Storch, Ph.D.**

David Storch graduated in biology from the Charles University Faculty of Science. He focuses on macroecology and evolutionary ecology, lectures at the Faculty of Science and the University of South Bohemia Faculty of Science. He is a co-organizer of the famous Biological Thursdays at Viničná seminars and a co-author of the books Landscape Biology: Biotypes of the Czech Republic and Doing Evolution. He is an editor of the Ecology Letters journal. Along with P. A. Marquet and J. H. Brown, he co-edited the book Scaling Biodiversity for Cambridge University Press. He is the director of the Center for Theoretical Study, a joint center of Charles University and the Academy of Sciences of the Czech Republic.