Let the Wild Forest Regrow Wild

Professor Krzysztof Spalik, Chairman of the PAS Committee for Environmental and Evolutionary Biology, tells us why the Białowieża Forest should be allowed to renew itself on its own.

Prof. Krzysztof Spalik, PhD, DSc works in the Department of Molecular Phylogenetics and Evolution of the Faculty of Biology, University of Warsaw.

spalik@biol.uw.edu.pl

ACADEMIA: **The Committee you chair has expressed "deep concern about the plans of the Polish State Forests administration to replant logging sites in the Białowieża Forest with seedlings from nurseries". Why is that?**

KRZYSZTOF SPALIK: We were alarmed by the letter from Deputy Minister Małgorzata Golińska to the speaker of the of the lower house of the Polish parliament responding to the questions of one of the MPs. She wrote that the planting would be diverse and would cover limited areas only, and that deciduous trees would be introduced to the areas previously occupied by homogeneous spruce stands, thus avoiding the creation of monocultures susceptible to bark beetle outbreaks. At first glance...

...that sounds good. So why is the Committee protesting, then?

Because the Białowieża Forest is a unique natural, ancient woodland, not an ordinary forest plantation. Nobody questions the need for replanting in typical commercial forests. We all need timber, so after harvesting we have to plant new trees. The natural renewal of a forest takes a long time. Planting young trees at harvest sites is a much faster method of afforestiation.

Is it because already-growing seedlings are planted?

Not only. In dense forests, logging creates gaps – this open, well-lit space is quickly colonized by herbaceous plants, especially grasses. They impede the growth of seedlings of many trees.

What species are selected for planting?

Tree species should suit a given habitat, i.e. pines for dry and sandy terrain, and deciduous trees for wetter

and more fertile areas. Still, pine trees prevail in forests throughout Poland. The predominance of coniferous trees in managed forests, namely Scots pine in lowlands and spruce in mountains, began in Germany back in the nineteenth century.

Why?

Because of a great demand for timber. Although some deciduous species, such as oak and ash, yield more valuable wood than pine, they grow more slowly. Pines grow quickly and provide good quality wood. Fortunately, nowadays the coniferous monoculture model has been abandoned in favor of mixed forests. These not only provide various types of wood, but are also healthier. When managing a forest, one must consider various factors contributing to its good functioning, e.g. maintaining a stable population of insectivorous birds in order to prevent outbreaks of pest insects. However, let me emphasize that "pest" is an economic concept, not a scientific one. A biologist will not call any native species a pest, as all species are indispensable elements of the natural forest ecosystem.

Therefore we can say that foresters are using more and more ecological methods in forest management and taking care to ensure species diversity. So why are scientists still complaining?

We truly appreciate the efforts of foresters to make the forests that cover almost one-third of our country more beautiful and healthier. But the management of the Białowieża Forest is a complex problem. Part of the Forest is a national park, some patches are protected as nature reserves, but the majority of the Polish part of the Białowieża Forest is a commercial forest. Still, the entire Forest was granted UNESCO World Heritage site status and is protected as a "Natura 2000" area. This form of protection does not exclude commercial use, but it imposes some protective measures. And in

this case, there is conflict between the requirements of nature conservation and the regulations applicable to state commercial forests. After logging, foresters are obliged to replant the harvested area within a specified period. Naturalists, on the other hand, would prefer the forest to be allowed to regenerate.

This problem was discussed during the debate about the Białowieża Forest, organized last year by the Polish Academy of Sciences: the State Forest inspectorates operate on the basis of their own regulations, different from those that apply to the national park, and simple good will on the part of any of the parties is not going to change that fact.

Yes, foresters are obliged to conduct reforestation and if we were talking about an ordinary commercial forest, we would not have argued over the harvesting and reforestation. But this is the Białowieża Forest, which was selected as a World Heritage site as an outstanding example representing significant on-going ecological and biological processes in the evolution and development of ecosystems and communities. So, let us allow these processes to act.

The Białowieża Forest has been used for centuries by humans as a source of wood, for hunting and beekeeping. Cattle once grazed open forests and clearings, changing the composition of plant communities. For example, exceptionally beautiful and species-rich thermophilous oak forests formed as a result of cattle grazing in the Białowieża Forest. In the past, this plant community occupied a large area of the Forest; now it has completely disappeared. During WWI and immediately thereafter, intensive logging took place. However, the clearings were not replanted but the forest regenerated naturally. All the ecological and evolutionary processes that should take place there, did occur. Thanks to these processes, despite human interference, the Białowieża Forest is still a natural ancient forest. Not only the trees, but also the herbaceous plants growing there have been subject to the continuous process of natural selection.

Why is it so important to allow the Białowieża Forest to regenerate on its own?

Because only by so doing will the ecological and evolutionary processes continue there in a natural way, and the Forest will keep its natural resilience.

In recent years, the Białowieża Forest experienced large-scale spruce dieback; it is estimated that approximately 30% of the population fell victim to a bark beetle outbreak. But let's remember that this mortality is not entirely random. Most susceptible to bark beetle damage are spruce trees growing in unfavorable habitats and those that are less resistant genetically. Trees growing in more favorable, damper habitats are usually healthier and can devote more resources to defense against herbivores. Genetic components are also important for tree immunity: an innate ability to cope with insect attacks. Under natural conditions, these most resistant trees will produce the most seeds from which the next generation will sprout.

Whereas the seedlings that foresters use for replanting are weaker?

Generally, forest replanting should be made using local stock, i.e. seedlings grown from locally collected seeds. But even if the trees in the nursery were grown from seeds obtained in the Białowieża Forest, these seeds were collected by people from particular trees: perhaps those that are most beautiful or those having numerous cones, or sometimes simply the easiest to

reach. This subjective human selection of seeds for reforestation has a serious consequence: the seedlings grown in nurseries do not represent full genetic variability found in the natural seed bank, i.e., the pool of seeds deposited in the soil. A planted forest will always be genetically poorer than a natural one.

Impoverished genetic variability is also a serious problem in the conservation of plant species, including their breeding ex situ and reintroduction. Genetic studies show that many populations of endangered species that were reintroduced to their natural or substitute habitats suffer from significantly lower genetic variation than the original wild populations.

In addition, plants in nurseries have comfortable conditions – they do not have to fight for access to water or light.

Certainly – and so they escape the natural selection. Although many seedlings die randomly in natural conditions, ecological factors also play an important role. Those seeds that fell in the right place in terms of habitat conditions are more likely to germinate and grow into adult trees compared to those trying to grow in poorer habitats. The microhabitat mosaic is rarely taken into account in forest management. If there is a small depression in the ground, the soil will be moister and spruce will grow better there than pine. It is difficult to match planting trees with the natural microhabitat mosaic.

And most of all, at each stage of natural renewal, natural selection process takes place: a large proportion of seedlings nonrandomly perish at the stage of germination, then at the age of one year, and later at the age of several years. The ones that survive are the strongest trees with genetically determined traits. The bark beetle outbreak in the Białowieża Forest has decimated spruce trees, leaving those that were more resistant than others. These trees pass their genes on to the next generation. The forest will be healthier than a forest made up of nursery seedlings that have not gone through such selection. However, as the environmental conditions and climate change, other sets of genes may turn out to be most beneficial in the future. Such combinations of features that make the plant adapted to local environmental conditions are called ecotypes. Therefore, it is extremely important to maintain the genetic diversity in populations.

But, in the first place, should spruce be renewed in the Białowieża Forest? During the aforementioned debate, the point was raised that due to the global warming this cold-loving species will be less and less frequent in our country.

Long-term fluctuations in the forest composition are natural and well-known. Currently, spruce is receding, but when I studied biology more than 30 years ago, Professor Janusz B. Faliński, a botanist and ecologist who devoted his entire professional life to studying the Białowieża Forest, told us that in the twentieth century the proportion of spruce in the tree stand had increased significantly, particularly in the deciduous lime-hornbeam-oak forests. Now, due to a lowered water table and the bark beetle outbreak, its share is much smaller and it may disappear from some deciduous stands, but that does not mean that it will entirely disappear from the Białowieża Forest. Still, in order to ensure that spruce is preserved, we must protect the natural ecological and evolutionary processes that shape the structure of the tree stand and the genetic pool of the species in the Białowieża Forest. Artificial plantings using nursery stock disturb these processes. Spruce will survive on its own if we do not interfere.

Is a planted forest equally susceptible to disturbances as a naturally regenerated one?

An artificially planted forest will always be less diverse genetically and also devoid of local ecotypes, and, therefore, less resistant to the attack by herbivorous insects or to other disturbances. However, it should be noted that such disturbances that are perceived as a disaster in commercial forests are often crucial for the preservation of species richness in natural forests. The formation of gaps due to wind, fire or insect infestations is a natural process. Such gaps are colonized by sun-loving plants, including grasses; ungulate species, including the iconic European bison, feed there eagerly. Bisons prefer semi-open areas; therefore, abandoning the planned replanting and retaining these openings would help to keep the animals within the Białowieża Forest and to reduce farmers' losses resulting from crop destruction.

Your letter states that the replanting will be more dangerous for the Białowieża Forest than the previous logging.

The logging of spruce was wrong, but it was a one-off incident. If we leave the Białowieża Forest on its own, these wounds will heal due to the natural ecological and evolutionary processes that still occur there. It is an extremely rich ecosystem, incomparable in this respect with any other in the Central European Lowlands. If we leave the areas affected by the bark beetle outbreak untouched, then the forest will regenerate from the seeds of trees and herbs that have been growing there for centuries. However, if we replant the gaps with nursery seedlings, we will break this natural continuity and introduce irreversible changes: the Białowieża Forest will cease to be a natural forest, becoming just one of the many forest plantations that cover our country.

Interview by **Agnieszka Kloch**
Photography by **Jakub Ostałowski**