

Forests are important place of living for many species of animals, plants and fungi. Especially natural forests, i.e. these which has never been seriously changed by human activity, like clear-cutting and artificial tree planting, are important for biodiversity. Also, forest provide several important services, like carbon storage and water maintenance. Thus, forests are important for both wildlife and humans.

However, recent anthropogenic climate changes influence forests, because differences in temperatures, precipitation, duration of growing season drive by climate changes directly affect trees. As an effect, some trees are becoming less common, while other increasing in number. But climate changes also increase frequency of extreme events, called “disturbances”, and these disturbances also affect forests. Most common disturbances are fire, windstorms and massive occurrence of some species of invertebrates foraging on trees. Bark-beetle developing in Norway spruces is one of such invertebrates. Under favourable conditions this small beetle can become very abundant and can kill spruces – such massive appearance is termed “outbreak”. Bark-beetle outbreaks are now increasingly common in Europe, but consequences of such events for species living in forests are largely unknown. Also, it is not clear whether forest managers should initiate any measures after such an outbreak, for instance it is not clear if killed trees should be removed from the forest, and what are the consequences of such removal.

The proposed project aims to analyse ecological consequences of massive bark-beetle outbreak in Białowieża Primeval Forest – a large natural forest located in Eastern Poland and Western Belarus. Since 2012 bark-beetle increased in number and have killed nearly half of the spruces originally growing in the forest. Next, part of these killed trees was removed (salvaged) by forest managers to stop further spread of the beetle. Remaining dead trees were left without intervention. As a consequence, the new habitats appeared in the forest: patches of dead standing trees killed by the bark-beetle, and open treeless areas after dead trees removal. Such configuration of habitats in Białowieża Forest provides an uncommon opportunity to investigate impact of disturbance (i.e. bark-beetle) and post-disturbance management (removal or non-intervention) on the animal communities in natural forest.

I plan to count birds, bats and butterflies in different habitats in Białowieża Forest: in undisturbed forest, at sites disturbed by the bark-beetle and at sites disturbed but cleared. Moreover, I plan to count these animals also outside forest (forest edge, farmland) to know reference level of their communities in these habitats. These three groups were selected because all of them can fly, so potentially can quickly colonize new openings in the forest, but differ in term of biology, preferred food, habitats and ability to move among different habitat patches. To improve effectiveness of the counts, I plan to use novel methods of voice recording – this will be used in case of birds and bats. Also, local habitats will be described to link observed diversity of birds, bats and butterflies with local habitat characteristics.

I expect to estimate changes in animal communities in response to bark-beetle outbreak and post-disturbance tree removal. Specifically, I predict that the bark-beetle outbreak markedly changes local animal communities, but this change is generally weaker as compared to man-made deforestation. Moreover, I expect that some species will benefit from the outbreak, especially during first years, whereas others will decrease in number and these changes will be landscape-dependent: disturbed forest patches located close to forest edge will be generally more often colonized by species from outside forest. Also, I predict that dead trees removal will be largely negatively affecting species typical for forest. Verification of these predictions has a chance to provide new recommendations concerning forest management and biodiversity conservation in the era of climate change and increasing disturbance frequency.