

The last outbreak of the spruce bark beetle in Białowieża Primeval Forest, which took place in the greatest intensity between 2012-2017, caused significant changes in Norway spruce and mixed stands of trees. It is normal for this area to leave large amounts of dead wood, including standing dead spruce (due to the application of nature conservation regulations). Such stands are also characterised by a different spatial structure (greater share of open areas) and changes in species composition of live trees (in mixed stands).

Forest bats are among the groups of vertebrates that are potentially highly susceptible to the impact of changes taking place in these stands. The occurrence of these mammals is limited by the number of naturally forming roosting places in trees (usually old or dead), the availability of foraging areas and food (flying insects). Insect outbreaks have a direct impact on all these factors, thus affecting the bat population. Changes in the forest ecosystem due to various factors are a dynamic process and animal populations adapt to changes in the environment. This also applies to bats.

We intend to test the hypotheses that after a disease outbreak spruce stands will play an important role as foraging areas for bats, and that dead standing spruce trees will be used by some bat species as nursery roosts. We also expect this to be true for those species that typically do not use conifers as roosts. The activity of bats will be examined in comparison to the situation in spruce stands not affected by spruce beetles, as well as changes in the species composition of bats, e.g. the appearance of species preferring open spaces, including synanthropic species, not normally associated with the forest.

Our work will use ultrasonic detection methods (recording flight and foraging activity of bats) and radio telemetry (in order to search for bat colonies, their feeding grounds and to determine the home range and flight distances). We will also analyse the food composition of bats using genetic analyses and compare it with the available species composition of insects found within plots in Białowieża Forest.

The study is concerned with the response of an ecologically important group of vertebrates to outbreaks of insects that are unique to Europe. The situation with the bark beetle in Białowieża Primeval Forest, which occurred in previous years, makes it possible to conduct these studies in conditions that are a reference point for other lowland forests of temperate zone. This means the results can be applied to other lowland forests of the Palearctic. The information obtained will allow us to broaden our knowledge of the functioning of forest ecosystems in European lowlands and their resilience to disturbance caused by mass insect outbreaks. Bats are an important component of the forest ecosystem, being the only predators massively hunting nocturnal flying insects. It is possible that their role in shaping the ecological balance of the forest after large-scale disturbances is greater than it is currently assumed.