Movement analysis of forest-dwelling avian predators: a novel bioindication method for evaluating functional heterogeneity in forest ecosystems

Abstract

In Europe, forests are one of the most severely affected ecosystems. In many regions in Europe, only small remnants of forest remain, while extensive logging has converted diverse natural forests into a matrix of heterogeneous but even-aged woods in other regions. retaining functional heterogeneity, biodiversity and ecosystem services in parallel with timber production and anthropogenic disturbances is a key challenge for sustainable forestry. However, assessment of ecosystem functioning is often complicated. Evaluating changes in total biodiversity is laborious and costly, but the efficiency of indirect assessment methods is limited. Ecosystem quality is more efficiently evaluated with reference to bioindicators, which are species reactive to environmental changes. Recently, several novel technologies, such as GPS-based telemetry, have seen rapid advances. This enables the replacement of indirect proxies, such as opportunistic observations of raptors or locations of their nest sites by the actual pinpointing of activity centres. In the current project, a novel bioindicative method to evaluate functional heterogeneity of forests will be tested. The aim of the study is to analyse how movement patterns of avian predators depend on forest structure and thus indicate functional heterogeneity in forest ecosystems. To reach the aim, bioindicator values characterising habitat quality will be estimated; data on structure and heterogeneity of forests with various impact of management will be compiled; statistical models explaining relationship between forest heterogeneity parameters and bioindicator values, and thus characterising functional heterogeneity of forests will be developed. The study will be conducted in a large heterogeneous forest area, the Białowieża Forest. Forests will be classified in two main classes (primeval and managed) and compared with respect to general characteristics and, more importantly, raptor distributions and behaviors. Presumably, movement patterns and values of other bioindicative characteristics of the study species differ in managed and primeval forests, but due to higher flexibility, generalist species adapt better to simplification of forest structure than specialist species, therefore their responses will be less pronounced.