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Characterization of the six recent woodpecker species in the Nationalpark Kalkalpen and the development of a habitat-model in GIS to evaluate the living space of woodpeckers in the area of the Nationalpark

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Abstract

The objective of the diploma thesis was to develop a habitat-model of 6 woodpecker species that recently occur in the Nationalpark Kalkalpen in Upper Austria. The modelis based on expert knowledge and literature review. The model, vicarious for the Three-toed Woodpecker (*Picoides tridactylus*) and the Black Woodpecker (*Dryocopus martius*), has been developed with a Geographic Information System (GIS) and has been evaluated with real woodpecker detections in the investigation area. The habitat model supplies a forecast quality of 94,34% with a total of 107 Three-toed Woodpecker records as potential breeding and foraging habitats in the Nationalpark area. In case of the Black Woodpecker with 362 records in potential breeding and foraging areas, the model delivers a forecast quality of 91,99%.

Also, the model should serve as an extrapolation tool in a Natura-2000 birdmapping in the Nationalpark, to determine the population density of the investigated species.

Keywords

Geographic Information System (GIS), habitat-model, Nationalpark OÖ Kalkalpen, woodpeckers;

Introduction

Many woodpeckers are called "keystone species" for their crucial role in creating habitats that suit other woodland wildlife. Abandoned woodpecker nest-holes become important nests or roosts for many birds, small mammals and invertebrates. In general, woodpeckers are bio-indicators of natural forests. Six out of ten breeding woodpeckers in Austria inhabit the Nationalpark Kalkalpen and therefore they represent an important flagship species for the institution.

Data & Methods

The basis for the model construction has been established upon data research of the six current woodpecker occurrences in the Nationalpark, a characterization and evaluation of the limited habitat factors by literature research, and additionally through to the knowledge of an expert. The used data were gathered out of the Nationalpark data pool (BioOffice) and the ZOBODAT (Zoological Botanical Database Linz). The used habitat suitability modeling technique is based on literature review and an expert opinion (BEIER et al. 2001), and generally follows the ideas found in the 1980 U.S. Fish and Wildlife Service publication “Habitat Evaluation Procedures Handbook” (U.S. Fish and Wildlife Service 1980). Unlike statistic-based models this method is relatively easy to create, doesn’t require costly new collections of detailed field data for all species in the investigation area and can be applied to multiple study areas. The habitat model is based on several factors like elevation, slope, topographic conditions, stand age and the tree species composition. These factors are raster layers with the same resolution (25metres), whereby within each factor several categories are classified. Multiple habitat factors are combined into an overall habitat suitability score for each raster pixel. An important step is to assign weights to each habitat factor that reflect their relative importance for a species. The result is a score per pixel from 0 (absolute non-habitat) up to 10 (best habitat, highest survival and reproductive success).

Result & Discussion

The results of the raw data research in the Nationalpark data pool and the ZOBODAT prove 1435 woodpecker records from 1982 – 2008. According to these results, the most frequent observed woodpecker taxon in the Nationalpark is the Black Woodpecker with 658 records, followed by the Three-toed Woodpecker (n=250), the Grey-headed Woodpecker (n=195), the Great Spotted Woodpecker (n=155) and the White-backed Woodpecker with 124 records. The Green Woodpecker (n=51) plays a subordinated role in the Nationalpark area.

The habitat model supplies a forecast quality of 94,34% with a total of 107 Three-toed Woodpecker records as potential breeding and foraging habitats in the Nationalpark area. In case of the Black Woodpecker with 362 proofs in potential breeding and foraging areas the model delivers a forecast quality of 91,99%. With the highest breeding respectively survival success (habitat class 9-10),24% of the Nationalpark surface can be allocated as potential optimal habitats for the Three-toed Woodpecker. 58% of the Nationalpark area are allocated as potential Black Woodpecker habitats with high to highest breeding respectively survival success. Including the usable, but suboptimal habitats, the potential dispersion of the Black Woodpecker increases up to 16.700 hectares (80%) of the Nationalpark surface.

The Three-toed Woodpecker and the Black Woodpecker require very different demands on their habitat. The Three-toed Woodpecker habitat map shows a hot-spot distribution which results from a high degree of specialization on the living-space. It needs old, autochthonous coniferous forests with deadwood. The Black Woodpecker is a generalist and the habitat map shows a homogeneous distribution among the Nationalpark area, except the karst plateaus of the Sengsengebirge and Größtenberg.

In 2011 the habitat model was applied in practice within the Natura-2000 birdmapping project (WEIßMAIR 2011) in the Nationalpark Kalkalpen. The model should serve as an extrapolation tool to determine the population density of the investigated species. Habitat models were created for all flycatchers, owls and woodpeckers that are currently living in the Nationalpark area. Compared to the results of the diploma thesis, the forecast quality of the Three-toed Woodpecker fell by 2,45% to 91,89%.

Conclusion and Future Work

A model tries to estimate the nature but it is not able to represent it. Every habitat model is as good as the input data it uses. The discussed habitat model also shows some weak points. The data quality of the stand age and the tree species composition has its deficits in some areas. A data layer with the information of deadwood could improve the forecast quality of the model. Furthermore, the model doesn't consider any competition for resources, such as food or breeding caves, between the different Woodpecker taxa. In the future the evaluated habitat model should serve the Nationalpark institution as planning base for further management decisions, e.g. monitoring.

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