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Population density and habitat preferences in a Tawny Owl *Strix aluco* population in floodplain forests in Eastern Austria

Christina Nagl & Christian H. Schulze

Abstract

Owls are among the most secretive birds on Earth. Hence, few data about these species are available, especially from the highly dynamic and often inaccessible floodplain forest ecosystems. In this study we assessed population density and habitat preferences of Tawny Owls *Strix aluco* in lowland floodplain forests along Danube and Morava River in Eastern Austria. Owls were surveyed using playbacks. To avoid double counting we recorded their calls, which allow individual recognition of the majority of birds. Following 50 river kilometres and covering an area of more than 10,600 ha altogether, we recorded and identified 60 individual male Tawny Owls. The high territory densities (5.0–7.8 territories/10 km²) indicate a high habitat quality of floodplain forests for this species. While our habitat models showed no significant difference of the occurrence probability of Tawny Owls between hardwood and softwood floodplain forests and no avoidance of Eagle Owl *Bubo bubo* territories, old trees (>80 years), a certain amount of openland and high amounts of standing deadwood did positively affect its occurrence. Our study provides evidence that the floodplain ecosystems with patches of old forest stands characterized by a high density of dead trees represent high quality habitats for Tawny Owls.

Keywords

Vocal individuality, Donau-Auen National Park, WWF-Nature Reserve Marchauen, standing deadwood, age of forest stands, Eagle Owl *Bubo bubo*

Introduction

Due to their nocturnal activity and secretive lifestyle, many owl species are difficult to monitor (TERRY et al. 2005). For some species, such as the Tawny Owl, their vocalizations turned out to be an effective and high-valued investigation-tool, as structural features of their calls can be used to identify individual birds (APPLEBY & REDPATH 1997a, GALEOTTI 1998). Hence, in this study vocal individuality of Tawny Owls was used as tool to assess its population density in the Danube-Morava-floodplain forests in Eastern Austria, which represent one of the last remaining large floodplain forest ecosystems in Central Europe. For this unique ecosystem conservation measures are essential. Changes in the hydrologic balance, intense forest management measures, forest damage, immigration of neophytes and excessive game stocks threaten the balance and existence of floodplain ecosystems and its species richness (LAZOWSKI 1999). Additionally, their protection is an important step to maintain near-natural forests and their associated high biodiversity.

Despite its low ecological specialization, the Tawny Owl is a good indicator for habitat quality (HIRONS 1985) and classified as flagship species for hardwood floodplain forests (FLADE 1994). Beside assessing the species' population densities in large floodplain forests along Danube and Morava River, this study aimed to evaluate the importance of landscape and forest structure on the species' habitat use. As deadwood volume and the presence of ancient trees simultaneously increase the availability of prey and breeding sites for owls (SCHERZINGER 1996), we expect that forest age and the amount of standing deadwood both are positively related to the occurrence of Tawny Owl. Furthermore, habitat choice and population densities of Tawny Owls may be negatively affected by the Eurasian Eagle Owl *Bubo bubo*, which is recorded frequently as predator (SERGIO et al. 2007).

Methods

Study site

Tawny Owls were surveyed in 10,602 ha lowland floodplain forest along the Danube and Morava River in northeastern Austria. The main part belongs to the Donau-Auen National Park (DANP, 9,338 ha). Most of the remaining area (1,129 ha) is located in the WWF-Nature Reserve March-Auen (Fig. 1). The study area ranges from Vienna to the Slovakian border, following approximately 36 river kilometres along Danube River and 14 km along Morava River.

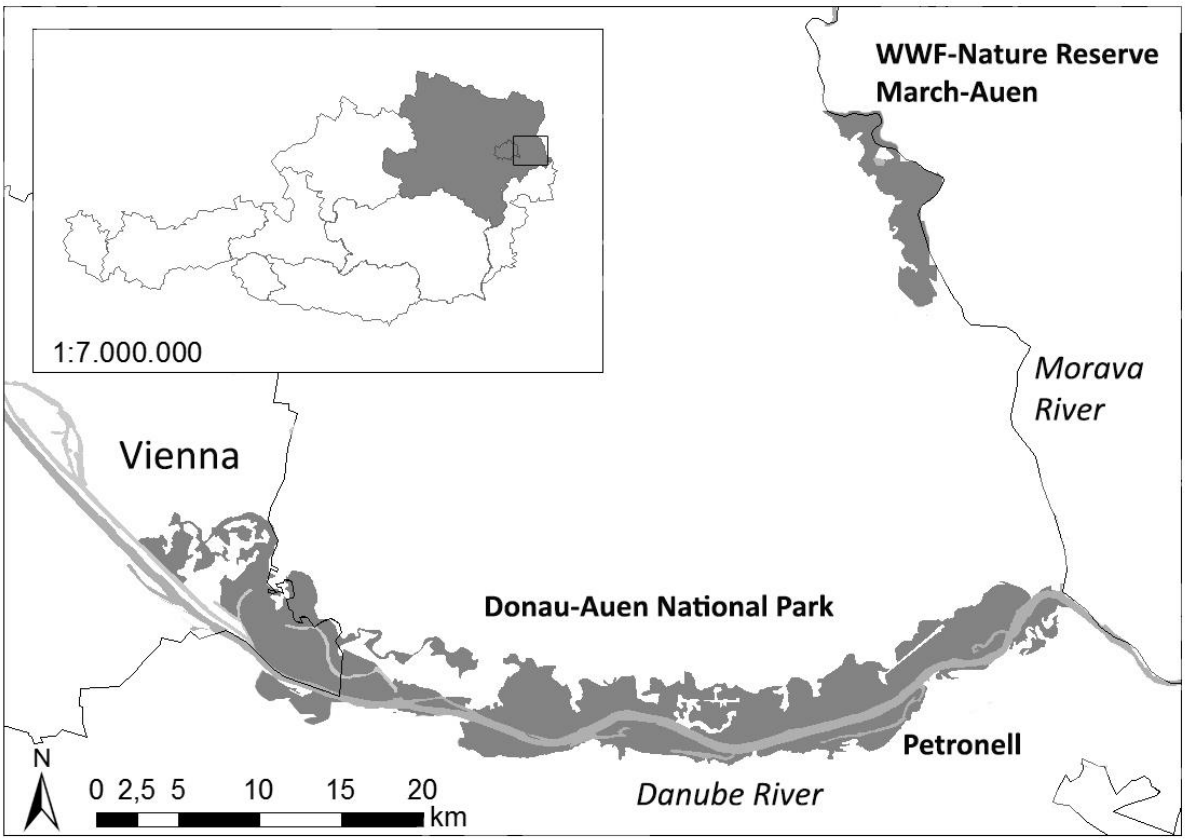

Figure 1: Study areas along Danube and Morava River marked in dark grey. Source: Esri.

Tawny Owl survey

Surveys were conducted during spring mating season between 1 March and 18 June 2012. Owl territories were located using a playback method (ZUBEROGOITIA & CAMPOS 1998) combined with a point-count methodology (JEDICKE 2009). In total 203 census points (with a minimum distance of 0.5 km between each other) were distributed over the study area and were visited once (census time: 30 min, REDPATH 1994). Hootings of territorial individuals were stimulated by using a playback of an unfamiliar male bird. Calls of males were recorded in good weather conditions with a Fostex Field Memory Recorder connected to a Telinga Pro 7 parabolic microphone.

Bioacoustical analysis

Sonograms of owls' hoot calls were plotted to take eight temporal and three frequency measures, which were subsequently used to identify individual owls.

Habitat variables and statistical analyses

To identify parameters affecting the Tawny Owl's territory choice, habitat type (openland, softwood and hardwood floodplain forest cover within 200 m radius), forest age, standing and lying deadwood classes and the occurrence of Eagle Owls were considered. A model selection approach (e.g. BURNHAM & ANDERSON 2002) was used to evaluate the importance of individual variables on the occurrence of Tawny Owls.

Results

Population density

Based on the sonagram analyses (Fig. 2), a total of 60 Tawny Owl territories were estimated for the entire study area, corresponding to a territory density of 0.57 territories/100 ha. Highest territory densities were found in the WWF Reserve Marchauen (0.78 territories/100 ha) and at Petronell (0.70 territories/100 ha). A slightly lower density of 0.50 territories/100 ha was recorded for the Lobau (western part of DANP).

Habitat choice

Our model selection approach indicated particularly strong effects of forest age and the amount of standing deadwood on the occurrence of Tawny Owls. The variables Eagle Owl territories, percentage hardwood forest and lying deadwood did not occur as explanatory variables in the group of best models, indicating that they had only a minor or no effect on the probability of Tawny Owl occurrence. The probability of Tawny Owl occurrence increased with forest stand age (> 80 years) (Fig. 3A), and increasing amount of standing deadwood (Fig. 3B).

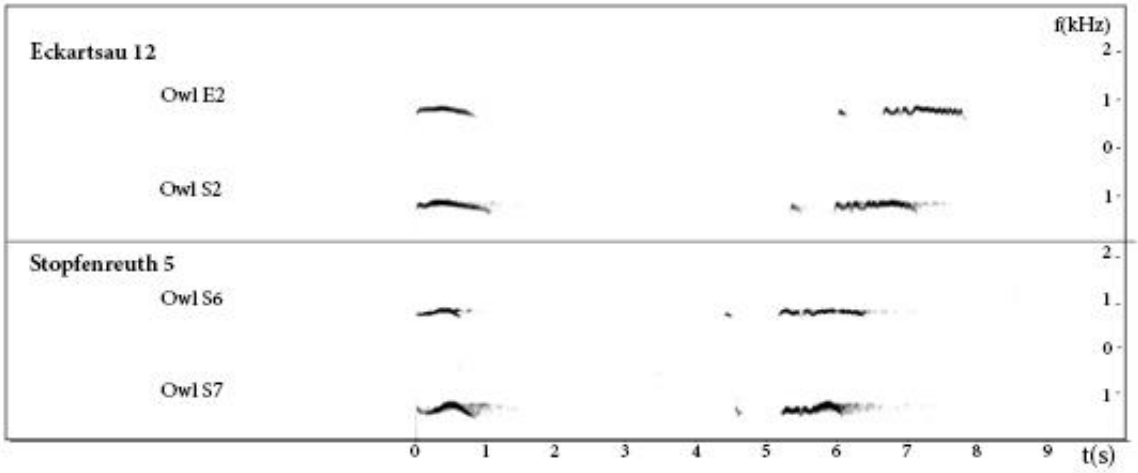

Figure 2: Sonagrams visualizing the calls of different Tawny Owl individuals on the same census points.

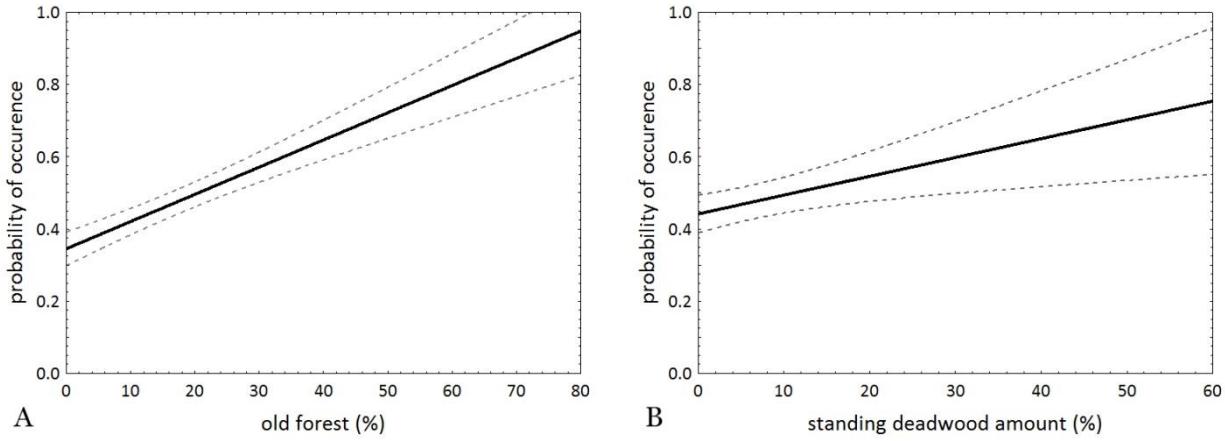

Figure 3: Relationships between predicted Tawny Owl occurrence and **(A)** old forest stand (>80 years) and **(B)** standing deadwood. Probabilities of occurrence were calculated for the best model. Dashed lines represent 95 % confidence intervals.

Discussion

Population density

The high population densities reported by this study indicate that floodplain forests along Danube and Morava River in Eastern Austria appear to be of great importance as breeding and hunting habitats for Tawny Owls. To assess the population density, vocal individuality proved to be a reliable tool (this study, APPLEBY & REDPATH 1997a, GALEOTTI 1998).

Habitat choice

Although Tawny Owl territories appeared to be more or less evenly distributed across our study areas, the presence of forest stands older than 80 years and a high deadwood amount increased the likelihood of territory occurrence. Forests of the Donau-Auen National Park are mainly between 20 and 60 years old (>74 %), only about 14 % of the trees are older than 80 years (POSCH et al. 1999). Mature oaks, for example, are twofold beneficial: they are cavernous (CARLSON et al. 1998) and during mast crop years they support prey productivity (JĘDRZEJEWSKI et al. 1994). Furthermore, old trees as well as standing deadwood represent valuable nesting sites for secondary cavity nesters (HAGAN & GROVE 1999), such as Tawny Owls.

Conclusion

Riparian lowland forests represent a unique ecosystem. The high population densities of Tawny Owls recorded in this study suggest, that the floodplain forests along Danube and Morava River represent high quality habitats for this owl species due to valuable amounts of old trees and a high standing deadwood volume. This generalist owl species shows preferences for near-natural forests, interspersed with patches of openland. The implemented reduction of forest management measures in DANP and the WWF-Nature Reserve Marchauen will have long-term effects on cavity richness, deadwood amount, tree age and prey availability. Hence, these conservation aims most likely will further optimize Tawny Owl habitats.

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Contact

Christina Nagl, Christian H. Schulze
chrissi.nagl@a1.net; christian.schulze@univie.ac.at
Department of Botany and Biodiversity Research
University of Vienna
Rennweg 14
1030 Vienna
Austria