

## Major roads have a negative impact on the Tawny Owl *Strix aluco* and the Little Owl *Athene noctua* populations

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**Abstract.** The increasing road networks threaten ecosystems by direct effects such as increased mortality due to collision with vehicles and by various indirect effects leading to road avoidance. We censused Tawny Owls *Strix aluco* and Little Owls *Athene noctua* in 2005, 2007 and 2009 in a rural landscape in Southern Portugal in order to study the effects of roads and habitat characteristics on Tawny Owl density and Little Owl presence. The presence of both owl species in the 70 census locations was coherent among years. Our results showed that Tawny Owl density near major roads was lower, with the negative effects extending possibly up to 2 km. The probability of Little Owl presence was also negatively affected by the proximity to major roads. The negative effects of roads were significant even considering habitat preferences and spatial autocorrelation, which had the most marked effect on the density or presence of both owls. The reduced occupancy by Tawny Owls and Little Owls of habitats near major roads may be caused by several factors, including increased mortality, disturbance caused by high traffic density, and increased fragmentation. Traffic noise in particular may affect intra-specific communication and hunting efficiency. Consequently, habitat near roads may represent lower-quality territories for owls.

**Key words:** *Athene noctua*, *Strix aluco*, Mediterranean landscape, road mortality, traffic noise

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### INTRODUCTION

The vast and continuously increasing road networks of modern societies have been revealing huge detrimental effects on natural patterns and processes of landscapes, which often operate in a synergistic way, ultimately leading to the destruction of wildlife habitats in a broad sense (Forman & Alexander 1998, Spellerberg 1998, Trombulak & Frissell 2000). Vehicle-caused mortality of wildlife is one of the most visible direct negative effects of roads, being the main cause of non-natural mortality for millions of birds every year (Erritzoe et al. 2003, Kociolek et al. 2011). Rare and endangered species can be particularly sensitive, since road mortality rates sometimes exceeds population input from reproduction and immigration

(Forman & Alexander 1998, Trombulak & Frissell 2000). But it has been assumed that some indirect effects of roads may have a greater effect on population persistence than vehicle-caused mortality (Forman & Alexander 1998, Reijnen & Foppen 2006). Major roads, characterized by high traffic, are mostly responsible for pronounced habitat fragmentation, creating a barrier effect capable of isolating wildlife populations into smaller metapopulations, and reducing connectivity (Forman & Alexander 1998, Lodé 2000). The consequent lower rates of genetic interchange among populations can cause the decrease of genetic diversity and other demographic problems that in many cases reduce ecosystem biodiversity and integrity (Forman & Alexander 1998, Trombulak & Frissell 2000, Holderegger & Di Giulio 2010).