


ORIGINAL ARTICLE

Does short-term habitat management for the European rabbit (*Oryctolagus cuniculus*) have lasting effects?

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Abstract

The European rabbit *Oryctolagus cuniculus*, a keystone species of Mediterranean ecosystems, is the target of several recovery and management plans throughout the Iberian Peninsula. The majority of these plans are limited in time by budget constraints and lack postintervention monitoring of population trends. This study was conducted in south-west Portugal and aimed to understand the effect of habitat management and its early cessation on rabbit populations. We assessed rabbit presence and relative abundance before management (2007), during the implementation of measures (2008), immediately after (2009) and 3 years after measures ended (2012). We applied a model selection approach, using generalized linear models to determine the relative importance of MANAGED and UNMANAGED habitat features on rabbit presence in each year. We used spatial eigenvector mapping to describe the spatial autocorrelation in rabbit presence and a variation partitioning approach to quantify the relative effects of management-related variables, unmanaged environmental descriptors and spatial characteristics on rabbit presence. Rabbit presence and abundance increased shortly after the management intervention but decreased 3 years after. Rabbit presence was positively related to the proximity of installed crops and the existence of favorable soils for digging. Habitat management-related variables explained most of the variation in all models. Habitat improvement actions, particularly the sowing of pastures, contributed to increased rabbit presence. We propose a continued long-term intervention and the cultivation of crops with auto-regeneration properties (e.g., subterranean clover—*Trifolium subterraneum*) with the aim of continuing to increase rabbit presence and abundance in areas where rabbit populations are scarce.

KEYWORDS

habitat management, long-term effectiveness, Mediterranean landscape, rabbit presence, variation partitioning

1 | INTRODUCTION

The European rabbit (*Oryctolagus cuniculus*), a species endemic to the Iberian Peninsula, is a prey of a wide variety of predators in this region. It is an important source of food for various carnivores and birds of prey, such as the red fox (*Vulpes vulpes*), the Egyptian mongoose (*Herpestes ichneumon*) or the eagle owl (*Bubo bubo*), including some endangered species, such as the Iberian lynx (*Lynx pardinus*) and

the imperial eagle (*Aquila adalberti*; Delibes & Hiraldo, 1981; Delibes-Mateos, Delibes, Ferreras, & Villafuerte, 2008; Jaksic & Sorriquer, 1981). Within its original distribution, it stands also as one of the most harvested game species, with high socioeconomic value (Paixão, Godinho, & Santos, 2009; Villafuerte, Viñuela, & Blanco, 1998). In recent decades, wild rabbits have suffered a >90% population decline (Cortés-Avizanda, Colomer, Margalida, Ceballos, & Donázar, 2015; Ferreira, Paupério, & Alves, 2010;