
Factors explaining the densities of European wild rabbits (*Oryctolagus cuniculus*) in central-southern Iberia

Javier Fernandez-De-Simon^{*1,2}, Francisco Díaz-Ruiz^{1,3}, Manuel Rodríguez-De La Cruz⁴, Francesca Cirilli⁵, Francisco Sánchez Tortosa⁵, Miguel Delibes-Mateos^{6,7}, Rafael Villafuerte^{1,7}, and Pablo Ferreras¹

¹Instituto de Investigación en Recursos Cinegéticos (IREC (CSIC-UCLM-JCCM)) – Ronda de Toledo nº 12, 13071, Ciudad Real, Spain

²Laboratoire Chrono-environnement (UMR UFC/CNRS 6249) – Centre National de la Recherche Scientifique - CNRS, Université de Franche-Comté – 16 route de Gray, 25000, Besançon, France

³Departamento de Biología Animal, Facultad de Ciencias, University of Málaga – 29071, Málaga, Spain

⁴Instituto de Investigación en Recursos Cinegéticos (IREC (CSIC-UCLM-JCCM)) – Ronda de Toledo nº 12, 13071, Ciudad Real, Spain

⁵Department of Zoology, University of Cordoba – Campus de Rabanales, Ed. Darwin, 14071, Córdoba, Spain

⁶Departamento de Biología Vegetal y Ecología, Facultad de Biología, University of Seville – Apartado 1095, 41080, Seville, Spain, Spain

⁷Instituto de Estudios Sociales Avanzados (IESA (CSIC)) – C/ Campo Santo de los Mártires, 7, 14004, Córdoba, Spain

Abstract

Several studies have investigated the causes determining population densities of rabbits (*Oryctolagus cuniculus*) in Iberian Mediterranean habitats, where the species plays key ecological roles. However, population effects of widespread predators like red foxes (*Vulpes vulpes*) on rabbits remain poorly known. Here we extend on the research of factors explaining rabbit population dynamics in central-southern Spain, focusing on fox predation and rabbit density-dependence.

We estimated fox diet by scat analyses, and fox abundance and rabbit density by spotlight counts in eight localities during two years. We run a multi-model selection procedure with mixed models to explain rabbit densities. The candidate models included all possible combinations of the following individual variables: fox predation index (i.e. fox kilometric abundance index multiplied by percentage of rabbits in fox diet), rabbit density in the previous semester, and predator control (yes/no) by hunters to benefit game species. The models always included year and season effects as fixed factors, and locality as random factor.

The most parsimonious model included only the previous rabbit density (negative effect), besides year, season and locality. According to this model, 12% of variation in rabbit population density was explained by fixed factors, and 97% of variation when considering both

*Speaker

fixed and random factors. Hence, the locality showed the greatest effect, though past rabbit densities and year significantly explained rabbit densities.

Results suggest current rabbit densities may determine future dynamics, as higher densities will be followed by lower growth rates and vice versa. Moreover, local conditions (e.g. soil softness, availability of food, water and shelter, etc.) might explain why rabbit density varied considerably between sites. Though fox predation might locally deepen rabbit population declines, we did not find such effects at regional scale. In conclusion, rabbit densities depend on many factors (some not studied here, e.g. diseases, hunting pressure, etc.) characterizing each locality.