

# Ecology and Conservation of Steppe-land Birds

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## Agricultural practices or game management: which is the key to improve red-legged partridge nesting success in agricultural landscapes?

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### SUMMARY

European agricultural landscapes hold important endangered and game species, which may add socioeconomical and ecological value to the ecosystem, and thus must be considered priority species in any management programme integrating agriculture, hunting and conservation. Patterns of red-legged partridges (*Alectoris rufa*) nesting habitat selection and nesting success provide information for the implementation of these kinds of programmes in agrarian pseudostepes. Nests occur mainly in cereal grain fields, although this habitat type was overall negatively selected and had the lowest nesting success. Only *lindes* (herbaceous strips among fields) were positively selected, and were also the habitat type with the highest nesting success. Nests within cereal grain fields were positively selected close to the field margins (mostly < 5 m). Agricultural practices, particularly harvesting, were the main cause of nest failure. Changes in agricultural practices would be a more effective means of increasing nesting success than predator control. Partridge breeding success may be improved by better management of agricultural areas, increasing the availability of *lindes* and slightly delaying cereal harvesting. These data may have implications for other endangered steppe-birds with similar nesting habitat, and may provide the basis for effective and successful collaborative programmes between hunters and conservationists.

**Keywords:** agrarian pseudostepes, *Alectoris rufa*, cereal, harvesting, nesting habitat selection, predation, Spain

### INTRODUCTION

Agrarian pseudostepes (open areas of mainly dry/unirrigated farmland) account for a high percentage of the south-west European land area (c. 47% in Spain) and thus its management may have a significant impact on biodiversity conservation (Pain & Pienkowski 1997). The advent of modern agrarian management systems, agricultural intensification and subsequent land abandonment during the last century have modified the quality and quantity of available habitat, and

consequently have had an impact on the viability of many species (Chamberlain *et al.* 2000; Donald *et al.* 2001; Bota *et al.* 2005).

The red-legged partridge (*Alectoris rufa*) is a typical species of the agrarian pseudostepes of south-western Europe, where it has considerable socioeconomic value in rural environments as the principal small game species (Lucio 1908; Bernabeu 2000; Martínez *et al.* 2002). Yet, despite its importance as a quarry species, populations of this game bird have suffered marked declines during the last century throughout its range (Cramp & Simmons 1980; Potts 1980), including Spain, the main stronghold of its native populations (Aebischer & Potts 1994; Blanco-Aguilar *et al.* 2004). Several reasons may explain these declines, but the most important appears to be habitat alteration, particularly changes occurring during recent decades in agrarian management systems (Lucio & Purrós 1992; Blanco-Aguilar *et al.* 2004; Vargas *et al.* 2006; Blanco-Aguilar 2007). Predation, overhunting and problems associated with farm-reared game releases, such as the introduction of new diseases or genetic introgression, may also be of concern (Nadal 1992; Villanúa *et al.* 2008; Blanco-Aguilar *et al.* 2008), but little is known about the relative importance of each one of these factors. Blanco-Aguilar (2007) concluded that agricultural intensification, along with overhunting of declining populations, were the main factors behind the deep decline in red-legged partridge hunting bags in Spain during the last few decades. However, little is known about which of the many agricultural changes are behind the red-legged partridge decline.

Ground vegetation height and cover around the nest have been described as the main factors affecting nesting success of red-legged partridges (Rands 1988; Ricci *et al.* 1990). Nevertheless, the majority of previous studies on red-legged partridge nesting habitat have been limited to general descriptions of habitat use (Potts 1980; Rands 1986; Rueda *et al.* 1993), whereas, few studies have considered nesting habitat selection (Rands 1988; Ricci *et al.* 1990). In France and UK, hedgerows and other permanent field boundaries are considered important nesting habitats for this species. However, in the Iberian Peninsula, these landscape structures are scarce, and field boundaries are formed instead by linear annual herbaceous-vegetation strips of unploughed land placed between cultivated plots or between these plots and tracks, known as *lindes*. Agricultural intensification in Spain, as in other European countries, has been associated with a decrease in the availability of *lindes* (Pain & Pienkowski 1997; Fuller 2000).

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