

Is the red-legged partridge *Alectoris rufa* naturally colonising the north of Lazio region, Italy?

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Abstract – The present study aimed to update the distribution of the red-legged partridge *Alectoris rufa* in Central Italy, with particular reference to the northern Lazio Region. This species was introduced into the regions of Umbria, Lazio, Molise, and Toscana, where it has partially acclimatized. Several reports on the species' presence and reproduction were reported from the northern Viterbo province, suggesting the necessity of a survey. Between 2010 and 2011, local people were interviewed (forestry agents, keepers, hunters and farmers), and a field survey was performed utilizing detection signs of presence and playback counts. All data were recorded in a geodatabase. Signs were georeferenced in a grid of 3,864 territorial units (TUs; 1 km x 1 km). Red-legged partridges were found in 190 TUs (19,000 ha): brigades, composed by 6 individuals on average, within 31 TUs; breeding pairs within 31 TUs; single birds within 128 TUs. To confirm the presence of breeding pairs, a playback survey schedule was performed throughout the spring of 2011 in a random sample of cells (28.9% of the cells in which the presence of the species had been reported) along line transect of 118 km length in total. Playback survey confirmed the presence of 25 breeding pairs and 6 single individuals within 31 TUs. Because the province of Viterbo did not perform restocking of the species, the detected distribution appears to be caused by the natural expansion of populations from Toscana and Umbria regions. Further studies are currently in progress to better appreciate the population parameters.

Key-words: *Alectoris rufa*, distribution update, central Italy.

INTRODUCTION

Declines in the distribution and abundance of many wildlife species associated with agricultural ecosystems have been acknowledged across Europe since the 1960s (Tucker & Heath 1994). The major causes of this reduction is found to be the abandonment of traditional agriculture in favour of mechanized and intensive agricultural practices (Murphy 1989), as well as excessive hunting pressure (Tapper 1999). However, the widespread introduction of set-aside throughout Europe from the mid-1980s and the reforestation of marginal agricultural areas were considered as possible mechanisms to reduce the adverse effects of agricultural impacts (Sotherton 1998). This has produced benefits for farmland wildlife, facilitating the colonization of species related to transitional and forested habitats (Amici *et al.* 2011).

Although the conservation status of the grey par-

tridge *Perdix perdix* in Italy is still critical after many years of massive reintroduction (Simonetta & Dessì Fulgheri 1998), the red-legged partridge *Alectoris rufa*, a species more adapted to dry hilly land with small bushes, has extended its areal distribution without management intervention, exploiting the abandoned marginal landscape and the transition habitat (Spanò 2010).

The red-legged partridge is currently classified in the Data Deficient (DD) category by the Italian Red List 2011, because there was not enough data to analyze the degree of genetic pollution and how the sub-populations are dependent on restocking for hunting purposes (Peronace *et al.* 2012). The species is listed in Annexes 2 and 3 of 2009/147/CE Directive, in Annex 3 of the Berne Convention, as it is considered to be at low risk (Least Concern) by the International Union for Conservation of Nature (IUCN 2011) and category 2 of SPEC (species with unfavourable conservation status in Europe) (Primack & Carotenuto 2003).

Italian and regional laws include the red-legged partridge on the list of hunting species. The Lazio region hunting regulation, however, did not include the species in the list of hunting species (Lazio Region 2011).

Widespread evidence of species presence and nesting in the northern region of the Viterbo province suggested the necessity of a monitoring plan. The aim of this study was to ascertain the stable presence of red-legged partridge in the north of Lazio region as a first step towards updating the status of its distribution in central Italy.

MATERIALS AND METHODS

The study area was located in the Viterbo Province, central Italy, in the zone managed by the ATC VT1 (ATC: Ambito Territoriale di Caccia; 187.496 ha; Fig.1). The elevation ranges from 0 m to 1,053 m a.s.l. Based on the climatic averages of the last 6 years (January 2005–December 2011), the average temperature of the coldest month, January, is 5.9 °C, while the average of the hottest month, July, is 23.8°C. On average, there are 33 frost days per year and 50 days per year with a maximum temperature equal to or above 30°C. In the period examined, the extremes of temperature were +38.6 °C in July 2005 and –5.8 °C in March 2005. The annual rainfall was 848 mm, distributed over 203 days on average, with the minimum in summer and the peak in autumn (Tuscia University weather station, 301 m a.s.l., 42° 25' 31.86" N, 12° 04' 43.47" E).

The landscape is highly fragmented, with cultivated fields that are interspersed with woodland and scrubland as well as with a gradient that increases from the coast towards the interior hills. Along the coast, the fields are planted with vegetables; in the inland, irrigable plain summer crops such as maize and sunflowers are the predominant cultivations, and winter cereals and forages are very often sowed after autumn. At the higher altitudes, orchards (vineyards, olive groves, chestnut and hazelnut) and woodlands dominated the hills. Most of the forests are coppiced, while timbers are present more frequently into protected areas.

The survey plan was performed using bibliographic research, interviews and field investigations. Scientific journals and conference proceedings were the principal source of the bibliographic data. By means of the major scientific search engines available on the Web, a search was performed using “red-legged partridge”, “*Alectoris rufa*”, “Italy”, and “distribution” as keywords. Subsequently, a further literature search was conducted on general Web search engines.

In the years 2010 and 2011, with particular attention to

pre-reproductive (March) and post-reproductive (August and September) periods, a plan for direct acquisition of information by interviewing reliable sources was designed. Direct or telephone consultations were made to agents of the State Forestry and Province Police Corps, hunters, volunteers from the Observatory for the Study and Management of Wildlife Resources at the University of Tuscia, and to others (hikers, keepers, and farmers). In particular, the information collected focused on direct and indirect (signs of presence) sightings that occurred in the 2009 and 2010 within the ATC VT1 area. On the basis of received reports, a geodatabase was built and upgraded using the ArcMAP™ 10.0 software (ESRI®). Each reference was inserted in a record containing the location, the type of sighting (individuals, couples, brigades, etc.), and all other information useful for the study. All reports were ordered and connected, through the same software, to a grid layer for subsequent analysis. In particular, a square grid with 3,864 cells (1-km side), was superimposed on aerial photographs and on the Technical Map 1:25,000 and 1:10,000 scale. Each cell was regarded as a territorial unit (TU). The reference system used was the European Datum (ED) 50, Zone 33 Northern Hemisphere. Each TU was assigned a value based on information of the presence/absence of the species, according to the types of sighting (single individual, couple, and brigade) (Fig. 1).

Using the geo-referenced reports, a random sample of 163 TU (28.9% of the total positive, 16,331.00 ha) was extracted, and in each of them transects were identified considering existing road layouts, altitude, and exposure, among other factors. These line transects were investigated using the technique of playback census (Bernard-Laurent & Laurent 1984, Serrani *et al.* 2005) in the period between March and April 2011. To elicit the territorial response of the males, the calls were emitted by a transmitter with a digital speaker (50 W power) every 500 m for 20 sec at each cardinal point, followed by 5 min of listening. The position of the male was identified through the terrestrial coordinates (with a GPS), and in cases of sighting, the distance was measured with a rangefinder.

RESULTS

Bibliographic survey

The red-legged partridge subspecies *rufa* is native of Italy (Snow & Perrins 1998, Andreotti *et al.* 2001); it is sedentary and nests on the northern Apennines as well as on the Toscana Archipelago (Elba, Giglio, Pianosa and Capraia). Additionally, the species was introduced and partially acclimatized in the Lazio, Umbria and Molise regions, with-

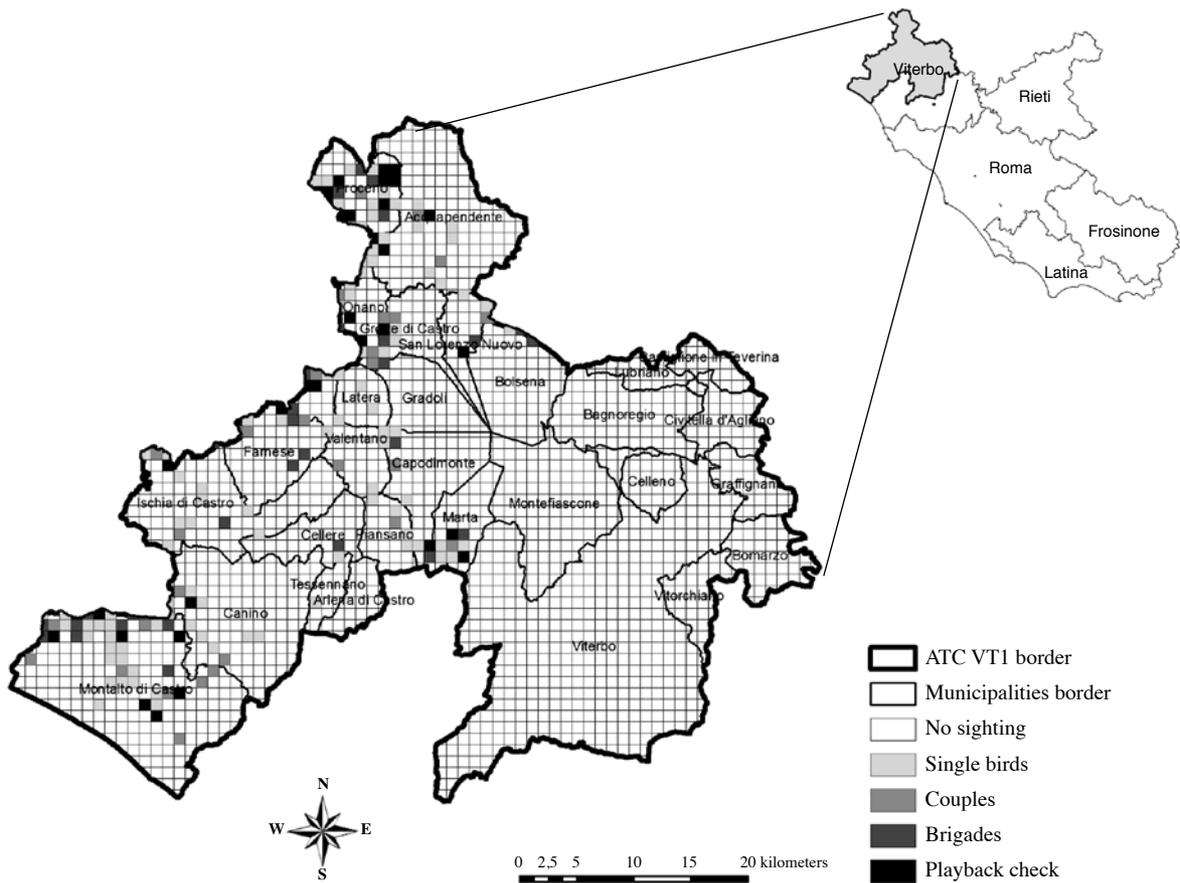


Figure 1. Map of territorial units with sightings of single birds, pairs or brigades, and playback positive response.

out success elsewhere (Alps, Friuli, Sardinia, etc.). Populations at the southern limits of the Apennines distribution are regularly restocked. Non-native subspecies (*A. r. hispanica*, *intercedens*, etc.) are often used for restocking. In the past, the subspecies was believed to be widely spread in the north-central Apennines (Piedmont-Marche) and the Archipelago Toscano (Elba and Monte Cristo), but almost everywhere, there has been a considerable decrease in the population (Brichetti & Fracasso 2004). In the Capraia and Pianosa islands, it became extinct at the end of the nineteenth century, but was successfully reintroduced in recent years (Tellini Florenzano *et al.* 1997).

In Toscana, a region of particular interest for this study because it borders the northern region of the ATC VT1, the red-legged partridge underwent a general and sharp decline in the last decades, but recently, it has been successfully reintroduced after restocking (Lucchini *et al.* 1999, Meriggi *et al.* 2007, Spanò 2010). Densities observed between the years 1995 and 2002 in the reintroduction areas of the province of Siena (Tuscany region) totalled approximat-

ly 5.7 heads km² and 1.4 broods km² (Brangi *et al.* 2003). In Umbria, the red-legged partridge was introduced and now is partially acclimatized (Brichetti & Fracasso 2004, Spanò 2010). Its “patchy” distribution is closely associated with the recovery actions of hunters exclusively for hunting purposes. These actions may lead to the formation of autonomous small populations, especially in wildlife areas and other regions off-limits to hunting (Renzini 1997).

In the Lazio region, the species was introduced in the Lucretili (Angelici 1995) and Lepini Mountains (province of Rome, Frosinone and Latina; Boano *et al.* 1995, Brichetti & Fracasso 2004), but its presence in these areas was not confirmed during recent data collection (Bulgarini 2011). The same author (Bulgarini 2011) reports observations of the species in the municipality of Blera (Province of Viterbo) and inside the Natural Reserve of Marturanum (Province of Rome) and suggests a possible consequence of restocking for hunting purposes. These two reports were registered in shrubby agricultural areas located around 300 m a.s.l.

Table 1. Number of territorial units (TU) investigated and number of TU where sightings (brigades, couples and individuals) were reported for each of the two used methods.

	Investigated TUs	Positive TUs with brigades	Positive TUs with couples	Positive TUs with single birds
Interviews	3.864	31	31	128
On field survey	163	-	25	6

Interviews

Each of the 156 people interviewed indicated the municipality and location of sightings, the date and whether the partridges were grouped (brigade), in pairs or appeared as single individuals. A subsequent screening of the responses made it possible to exclude double counting. During the period of 2010-2011, the number of TUs with positive signals was 190: brigades were detected in 31 TUs and were composed of 6 individuals on average; couples and single individuals were detected in 31 and 128 TUs, respectively (Tab. 1, Fig.1).

On-field survey

The on-field survey confirmed the presence of a minimum of 25 territorial males, to which 6 random encounters with single birds were added for a total of 31 sightings (one for each TUs; Tab. 1, Fig.1).

The Index of Kilometric Abundance (IKA) relating only to “breeding pairs”, calculated on the 118 km of covered transects, was equal to 0.21 pairs km⁻¹.

DISCUSSION

The results of this study show a homogeneous distribution along the ATC border with the provinces of Grosseto and Siena where the red-legged partridge was actively managed for decades. The presence of the species on the border with the province of Terni was scarce. A descending presence has been detected from the border with Toscana (municipalities of Montalto di Castro, Canino, Ischia di Castro, Farnese, Valentano, Onano, Proceno, and Acquapendente) and Umbria (municipalities of San Lorenzo Nuovo and Bolsena) to the most internal municipalities such as Grotte di Castro and Latera. This situation, together with the absence of significant distribution gaps, suggests that the presence of the species is the result of natural expansions of the populations from the south of Tuscany and Umbria. This fact is also presumable based on the analysis of available literature.

The distribution, although still patchy, does not present large voids. Among the probable factors of disturbance to

the natural expansion of the species, we can list the illegal killing and the widespread presence of opportunistic predators (foxes, corvids) typical of unmanaged habitats. In the study area, the authors were able to observe the direct predation of nests and nestlings of pheasants in specific wildlife areas (repopulation and capture areas). Therefore, predation pressure might represent a limiting factor also for the natural expansion of red-legged partridge, as also reported by Vargas *et al.* (2006).

A monitoring program must be planned in the near future to increase the depth of knowledge regarding the population parameters and to predict the dynamic expansion of the species as well as promote the most suitable management actions. In this regard, we can exclude any risk of hybridization with Apennine rock partridge because there is no suitable habitat for this species within the ATC VT1 territories. However, the risk of intraspecific competition with the grey partridge, restocked in the years 2006-2007 (Amici *et al.* 2007), must be carefully assessed.

If the population is free of genetic pollution with congeners species, the dispersal of the red-legged partridge in the northern province of Viterbo is a likely natural process, contrary to what is indicated by Bulgarini (2011), that should be considered as an element of enrichment of biological diversity. The metapopulation management approach, which also involves neighbouring regions, might encourage the affirmation of the species.

Acknowledgements – This research was supported by ATC VT1. The authors thank the agents of the State Forestry and Provincial Police Corps, the hunters, the volunteers from the Observatory for the Study and Management of Wildlife Resources of the University of Tuscia and all those who contributed to the success of the research.

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