

Conservation status and hunting management of red-legged partridge *Alectoris rufa* in the Eastern Province of Genoa (Liguria Region, NW Italy)

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Abstract – Spring song census with playback technique in the years among 2006 and 2011 in two Provincial Conservation Areas (P.C.A.) and the monitoring of the hunting bags carried out during the seasons 2008/2009 and 2009/2010 gave the chance to evaluate the status of the populations of red-legged partridge (*Alectoris rufa*) in the territory at East of Genoa. In the two P.C.A. the densities of potential nesting pairs present average-low values, with a trend toward a worrying decline. Furthermore the monitoring of the bag put in evidence physical precarious condition of the wild specimens (low weight). The examination of data of shot partridges showed also the low performance of summer restocking with young individuals as regards the strengthening of natural stocks. Taking account of the collected data, it is sketched out that the conservation status of the natural populations of red-legged partridge in the study area is not satisfactory. This might be due to the falling of the environmental vocation for the species which characterised the evolution of territory in the last years. Furthermore, this indicates a low capacity of consolidation and restoration of natural stocks by introduced individuals.

Key-words: conservation, hunting management, red-legged partridge, Genoa, Liguria.

INTRODUCTION

Genoa Province is divided into two Hunting Territorial Zone (H.T.Z.) (A.A.VV. 2003); after more than fifteen years of closure, starting from 2006/2007 season, hunting activities involving red-legged partridge (*Alectoris rufa*) have been reopened all over the province.

In order to verify the conservation status of the population of red-legged partridge, the H.T.Z. Genoa 2 East has activated a monitoring activity on hunting bags during 2008/2009 and 2009/2010 seasons; collected data have been compared with those coming from spring song census of the species undertaken since 2006 in collaboration with the Province of Genoa inside the two Provincial Conservation Areas (P.C.A.) called “Biscia Bocco” and “Monte Ramaceto” (Aa Vv 2003).

In this paper we report the results of the analysis of these two sources of data to the aim of better understanding the status red-legged partridge in Eastern Province of Genoa also for management purposes.

MATERIAL AND METHODS

The song census inside P.C.A.s was conducted with a playback technique: from mid-March to mid-April, in fact, the territoriality linked to the formation and consolidation of pairs, induces red-legged partridge males to promptly respond to recorded calls typical of the species, in particular during the first hour after sunrise (Ciuffardi *unpubl. data*).

With a good of approximation and promoted by the proximity of the reproductive season, the number of male songs heard during the census equals the number of potential nesting pairs located in the monitored area (Spanò 2010).

The census was carried out with a “Micro” Bird Sound player, including an “High Efficiency Trumpet” Bird Sound external speaker, along two transects: the first (3.61 km) within the PCA “Monte Ramaceto” and the second (4.54 km) in the PCA “Biscia Bocco”.

Along both transects, five points for song broadcasting were identified; each point was chosen on a territory

morphology basis so as to ensure the audio diffusion over a wide area, allowing the maximum coverage of territories adjacent to the transect while avoiding the possibility of double counting.

In each point the song broadcasting and the listening to answers from the red-legged partridge males lasted 24 sec and 1 min respectively; we alternated song broadcasting and listening for 5 times in each point.

Censuses have been carried out from 2006 to 2011 twice a year, from half march to half april, for both PCA. From the data collected through field activity, the average values of the index of kilometric abundance (IKA) of pairs inside the two PCAs were obtained during the years between 2006 and 2011; through the conversion ratio suggested by Ricci (1989) the results of the IKA were also converted into density of pairs per 100 ha.

Regarding the analysis of hunting bags, during the hunting seasons 2008/2009 and 2009/2010 for each kill in the territory of H.T.Z. Genoa 2 East the following data were collected: weight (not all hunters sent this measure value to us, so that we do not possess all weights for killed animals); presence/absence of the identification ring; sex (throughout the presence/absence and eventually shape of the metatarsal spurs); age (by the observation of the primary pinion feathers: sharp in the young of the year, sharp but very worn in 1-year old adults, rounded in adults more than one year old) (Spanò 1986, Spanò *et al.* 1998, Spanò 2010).

During the summer seasons 2008 and 2009, in mid-September, 1910 and 990 red-legged partridges were respectively released at the estimated age of 150 days. For a correct analysis of hunting bags it must be noted that the red-legged partridges released during summer 2008 were provided with an identification ring that were instead not present on the animals released during summer 2009.

For the statistical analysis of results χ^2 test (with Yates correction) and t-test were used. The yearly variation of mean value of IKA was evaluated with non parametric Spearman test (Fowler & Cohen 2002; tests calculated with STATISTICA Software).

RESULTS

The density of red-legged partridge in the two study areas varied between 13.57 ± 6.40 (2006 spring) and 1.13 ± 1.60 pairs/100 ha (2011 spring) in the PCA “Monte Ramaceto” and between 9.81 ± 6.31 pairs/100 ha (2006) and 3.57 ± 2.52 in the PCA “Biscia Bocco” (2011) (Tab. 1). The yearly spring song census in 2006–2011 period showed, for both areas, a seeming trend towards a decline of occurrence of the species, but the trends were statistically significant only in the PCA “Monte Ramaceto” ($r_s = -0.81$, $T = 2.72$, $P = 0.049$ for PCA “Monte Ramaceto”; $r_s = -0.696$; $T = 1.94$, $P = 0.12$ for PCA “Biscia Bocco”; Fig. 1).

From the examination of hunting bags it can be observed that during 2008/2009 hunting season, on a total of 27 animals killed inside H.T.Z. Genoa 2 East area, 16 carried the ring. In hunting season 2009/2010 instead none of 41 killed animals carried the ring (comparison between years: $\chi^2_1 = 28.6$, $P < 0.0001$).

The average weight of measured specimens ($n=54$) was 392.00 g (± 87.30 SD). By separating the specimens whose sex was determined, it was obtained an average weight of 426.67 g (± 67.09 SD) for males and 390.46 g (± 94.20 SD) for females (Fig. 2). During the 08/09 hunting season, young reared partridges with ring (with an age roughly estimated at 150 days in mid-september) showed a slightly higher weight (average weight = 459.08 g ± 66.85 SD; $n = 12$) with respect to the wild red-legged partridges naturally present in the area (average weight = 413.00 g ± 51.17 SD; $n = 9$), but the differences were not statistically significant ($t = 1.72$, $p = 0.10$).

All data collected during the hunting seasons 08/09 and 09/10 allowed us to establish a sex-ratio of the killed animals equal to 1M:1.3F. However, the difference between the observed number of males (23) and females (29) was not statistically significant ($\chi^2_1 = 0.48$, $P = 0.49$; Fig. 3).

The analysis of data collected during seasons 08/09 and 09/10 allowed to obtain a young/adults ratio equal to 2.3Y:1A. The difference between the observed number of

Table 1. IKA (pairs/km) and density (pairs/100 ha) values of red-legged partridge in the Provincial Conservation Areas “Biscia Bocco” and “Monte Ramaceto”, obtained in the first and last year of census with playback technique.

P.C.A.	Year	Average \pm SD IKA (pairs/km)	Average \pm SD density (pairs/100 ha)
Monte Ramaceto	2006	1.98 ± 0.93	13.57 ± 6.40
Biscia Bocco	2006	1.43 ± 0.92	9.81 ± 6.31
Monte Ramaceto	2011	0.17 ± 0.23	1.13 ± 1.60
Biscia Bocco	2011	0.52 ± 0.37	3.57 ± 2.52

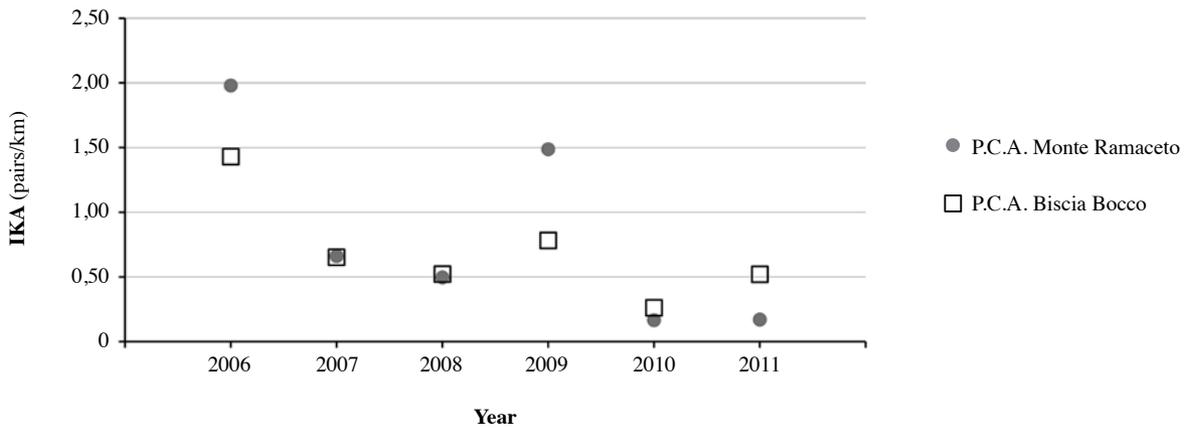


Figure 1. Yearly variation of IKA (pairs/km) of red-legged partridge in the study years (2006-2011) in the Provincial Conservation Areas “Biscia Bocco” and “Monte Ramaceto”.

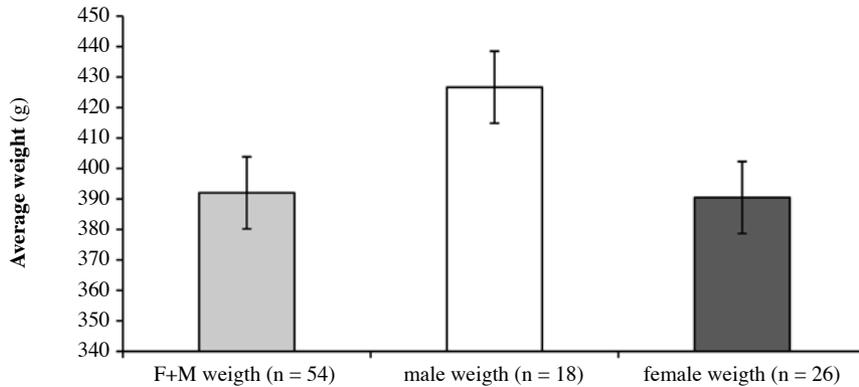


Figure 2. Weight of 54 animals killed inside H.T.Z. Genoa 2 East area during the hunting seasons 2008/2009 and 2009/2010. For 44 out of 54 individuals, sex was established and mean weight for males and females is shown.

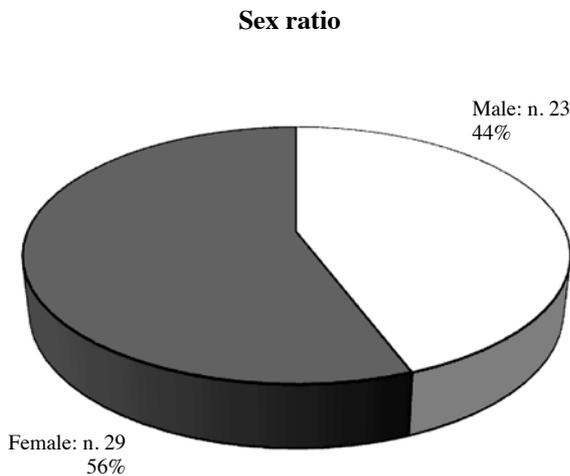


Figure 3. Sex ratio of the animals killed inside H.T.Z. Genoa 2 East area during the hunting seasons 2008/2009 and 2009/2010.

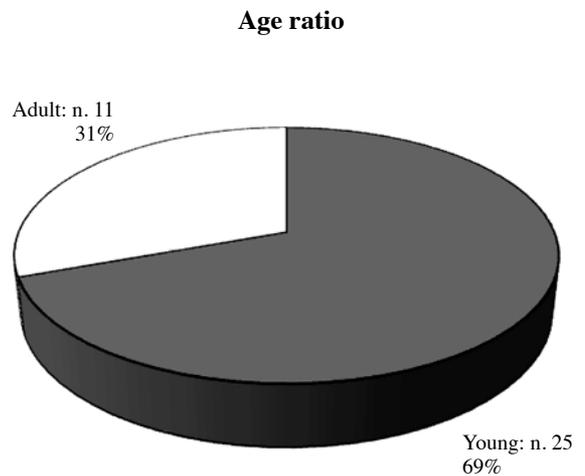


Figure 4. Age ratio of the animals killed inside H.T.Z. Genoa 2 East area during the hunting seasons 2008/2009 and 2009/2010.

young (25) and adults (11) was statistically significant ($\chi^2_1 = 4.7$, $P = 0.03$; Fig. 4).

DISCUSSION

The results of the song census seem to indicate a decreasing trend of the species, although this trend was statistically significant only in one of the two study areas. The densities monitored between 2006 and 2011 show a change from initially high values, comparable to those monitored in the Italian territories most suitable for the species (see Spanò *et al.* 1998, Spanò 2010), up to medium-low values, near to the lowest limits generally recorded for the average densities (Spanò 2010). The negative trend observed in the two PCA is in line with the negative conservation status of red-legged partridge recorded at European level (BirdLife International 2004).

The examination of hunting bags, in particular the observed absence of ringed individuals after one year from release, suggests that summer restocking activities with young animals are unable to carry positive effects in terms of success on the area and consolidation of natural populations of red-legged partridge, as probably individuals that survived the hunting period may fail to overcome the winter season. This might be related to the difficulty in finding feeding resources in the area. However, other factors might be involved such as predatory pressure and diseases. The lack of food sources suitable for the maintenance of natural populations of red-legged partridge seems to be confirmed by looking at the data on the weights of killed animals: given that in general in pure populations the average weight is equal to 505 g for males and 433 g for females (Meriggi without date), with weight peaks up to more than 550 g (Spanò *et al.* 1998, Galli 2006, Spanò 2010), the values recorded in our areas seem to reveal a deficiency in terms of food resources for the sustenance of red-legged partridges. The low weight of partridges in the study area was even more evident considering only the wild individuals (i.e., non ringed individuals in hunting season 08/09).

About the observed sex ratio it should be noted that the predominance of males reported in the literature refers to the period from late winter to early spring and could be related to a different winter mortality between the sexes, higher in females as highlighted by Spanò (2010). The ratio of 1M:1.3F recorded by game hunting in the present study, apparently in opposition to the prevalence in nature of males (see Spanò *et al.* 1998, Spanò 2010), seems to

highlight a greater vulnerability of females with respect to the hunting activity, that could lead to a possible prevalence of males at the end of the hunting season; this data, however, is not statistically significant and therefore must be considered with caution.

About age ratio, although a predominance of young individuals may generally indicate a population in good conditions, in this case the ratio is reasonably influenced by the summery restocking of young, which certainly constitute a significant part of killed animals.

The collected data therefore indicate that the conservation status of the natural populations of red-legged partridge is not satisfactory, probably due to the loss of the environmental vocation for the species, which characterised the evolution of Italian and Ligurian territories in the last years, with the clear expansion of the wood (Stoch 2012) at the expenses of more open and cultivated areas more suitable for the species (Spanò 2010). Furthermore, this indicates a low capacity of consolidation and restoration of natural stocks by the introduced individuals.

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