FORESTRY IDEAS, 2022, vol. 28, No 1 (63): 24–29

FIRST RESULTS FROM RADIOTELEMTRY TRACKING OF WILD GREY PARTRIDGES IN SOUTH BULGARIA

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Received: 05 July 2021 Accepted: 19 Yanuary 2022

Abstract

The Grey partridge (*Perdix perdix* L.) is a common gamebird in Bulgaria but some important parameters of its population are still poorly studied. In this paper we present results from the first radio telemetry study of wild Grey partridges in the country. A total of six partridge males were captured in two study sites in Upper Thracian Plain. Monitored birds stayed near the capture point with a mean dispersion distance of 486.9 m ±309.5 SD (min-max 54.28–1307.24 m). Sufficient data to define home range size was possible for only one adult individual and 100 % Minimum convex polygon (MCP) equaled 17 ha. Within its home range, this male partridge showed a preference for an unusual part of its home range, an area for the storage of straw bales used by a bioenergy production facility. This observation confirms the species ability to adapt to changing types of land use in agricultural ecosystems.

Key words: dispersion, habitat use, MCP, radio telemetry.

Introduction

The Grey partridge (*Perdix perdix* L.) is a common species with a decreasing population trend across most of its range (Keller et al. 2020) caused by drastic changes in habitats due to agriculture intensification over recent decades (Kuijper et al. 2009). In Bulgaria, the Grey partridge is under a regime of conservation and regulated hunting (Hunting and Game Preservation Act, Annex 1). The better understanding of some population and ecological parameters like home range, dispersion, survival, habitat preferences, etc. are important to successful management. Furthermore, recent papers report dynamics of these parameters over time as a result of adaptation of the Grey partridge to the changes in its habitats (Ronnenberg et al. 2016, Harmange et al. 2019). At the same time, data on such parameters of the species' population on the Balkan Peninsula are scarce.

This study presents results from the first Bulgarian radiotelemetry survey of partridges from wild populations in the species' typical habitats in the Upper Thracian Plain.

Materials and Methods

The study was carried out at two separate sites: Stroevo (42°14‘ N, 24°41’ E) in 2016 and Saraya (42°14‘ N, 24°19‘ E) in 2019. Both sites are located in the Upper Thracian Plain (Middle South Bulgaria) and comprise predominantly arable land sustaining breeding densities in the surveyed years of respectively 20.5 pairs/km^2 and 12.8 pairs/km^2, which could be accepted as high compared to that reported in numerous European countries (Bro et al. 2005). Predator control in these areas was not carried out as part of the study. Red foxes (*Vulpes vulpes*) and Golden jackal (*Canis aureus*) were rarely hunted by the local hunters.

The birds are captured on March 15th and March 19th 2016 in Stroevo and on March 15th 2019 in Saraya using MIST NET 716/7 (ECOTONE) and each bird was tagged with 10g radio transmitter RI-2B (Holohil Ltd.) with mortality mode and necklace type of attachment. The tracking of the tagged birds was conducted by using a Field Marshall 4000 receiver with Yagi antenna (Marshall Radio Telemetry) and range of up to 3 miles. The location of each bird was determined via triangulation and switching between *Far* and *Medium* range settings of the receiver allowed us to obtain precise location whit minimum or no disturbance of the birds. The tagged birds were located every 3–7 days, between mid-March and late-June. The gender of captured Grey partridges was determined according to Schroeder and Robb (2005). A total of four adult male Grey partridges were tracked in Stroevo in 2016 and two males (one adult and one juvenile) in Saraya in 2019.

The dispersion of the birds was measured with Google Earth Pro (Google LLC) as a straight line between the capture point and each location during the tracking. The difference between dispersion of the birds in the two areas was analyzed with Kruskal-Wallis nonparametric test carried out in free software product PAST (Hammer et al. 2001).

Tagged individuals’ home ranges were defined by minimum convex polygon (MCP) (Mohr 1947) using CALHOME software (Kie et al. 1996) and birds’ habitat preferences were estimated by applying Jacob’s Index (Jacobs 1974) for the predefined seven habitat types within the 100 % MCP and six within the 95 % and 90 % MCP. Within the 100 % MCP, the cereals had the greatest coverage (65.4 %), followed by the sunflower (10.8 %) and the straw bales storage area (11.8 %). The alfalfa, the abandoned irrigation channel and the earth roads occupied 5.14 %, 4.55 % and 1.48 % of the area, respectively. A small proportion (0.8 %) of the 100% MCP was occupied by a small, relatively dense patch of black locust (*Robinia pseudoacacia* L.) with approximate vegetation height of 5 m.

Results and Discussion

Two of the tagged birds in Stroevo died within 10 days after releasing due to predation and the fate of a third individual remained unknown because of losing the signal from the transmitter. Other three individuals (one from Stroevo and two from Saraya) survived to the end of the study, hence the estimated survival is at least 50 %.

The male partridge in Stroevo was monitored for nearly 3 months until the transmitter fell off due to failure of the harness. We were able to observe the two birds in Saraya for about a month but both individuals were legally shot on December

8th 2020, 21 months after tagging. Hence the adult male was at least two and a half years old at the time it was shot. Although on March 23rd 2019 it was observed with sings of injury (missing rectrices and contour feathers, damaged remiges) and poorly flying the individual managed to survive longer than the mean longevity reported in other parts of its range (Weigand 1980).

The mean dispersion distance of all tagged individuals was 486.9 m ±309.5 SD (min-max 54.28–1307.24 m). The estimated mean dispersion distance of the monitored partridges in Stroevo was 288.23 m ±126.7 SD (min-max 54.28–530.43 m) and was significantly lower than that observed in Saraya 884.24 m ±282.9 SD (min-max 604.11–1307.24 m) (Kruskal-Wallis chi square = 10.5, $p < 0.01$). The observed mean dispersing distance was lower than reported in similar studies in other parts of the Grey partridge's range (Putaala and Hissa 1998).

Estimating the MCP was possible for only one of the tagged birds, which was located 10 times between March 19th and June 30th. The 100 % MCP of this individual captured in Stroevo was 17 ha and the area of 95 % and 90 % MCP was 9.4 ha and 5.8 ha respectively. Observed home range size in the present study was much lower than previously reported for reared Grey partridges in CW Bulgaria (Angelov et al. 2019) which is expected given the poor habitat quality in that particular site and the origin of the released birds. So far there are no data on Grey partridge's home range size in Bulgaria, but results in the present study are similar to those observed in high density wild populations in Central Europe (Šálek et al. 2002, Warren et al. 2017). The results of the Jacob's index for estimating habitat preferences of the monitored bird are based on 10 locations recorded between mid-March and the end of June (Table 1). This male partridge showed a preference for the abandoned irrigation channel, a small patch of black locust and to an unusual part of the study site occupied by a storage area for straw bales used in a bioenergy production facility (Fig. 1). The individual was located in that area on four consecutive observations between April 26th and May 23rd 2016.

The longest monitored male partridge at Stroevo inhabited an area less than 10ha (MCP 95%) from March 19th until the end of June 2016. Reported Grey partridge's home range during breeding season varies considerably across different studies from several (Šálek et al. 2002) to hundreds of hectares (Novoa et al. 2006) according to the habitat quality. Our results are similar to those reported for France and Czech Republic (Birkan and Serre 1988, Šálek et al. 2002).

The bird showed a preference for an abandoned irrigation channel and a straw bale storage area instead of the other parts of the habitat such as alfalfa, cereal and sunflower fields as well as earth roads within the bird's home range. The irrigation channel can be considered as a permanent shrub-dominated cover strip, which partridges can benefit from as reported in other studies (e.g. Panek and Kamieniarz 2000). The sunflower crops had a negative Jacob's index. During the monitored period, the sunflower was short and sparse, and did not provide shelter or feeding places. This is the probable cause for the negative Jacob's index in the study period. The next habitat with a negative index was cereal crops. During the study period these crops had a greater height and coverage. Such vegetation has been reported to increase vigilance consequently reducing fitness of the birds

Table 1. Jacob's index values for every habitat type determined in each MCP* area.

MCP, %	Sunflower	Cereals	Alfalfa	Abandoned irrigation channel	Earth Roads	Black locust patch	Straw bales storage
100	-0.04	-0.53	-1.00	**0.38**	-1,00	**0.92**	**0.54**
95	-0.03	-0.53	N/A	**0.81**	-1.00	**0.88**	**0.34**
90	-0.16	-0.54	N/A	**0.76**	-1.00	**0.82**	**0.70**

Note: *MCP is Minimum convex polygon; values in bold show preference to a particular type of habitat.

Fig. 1. Tagged individual observed in the straw bale storage area in Stroevo.

(Watson et al. 2007).

The preference of Grey partridges for the storage areas for straw bales has not been reported in Bulgaria yet. The factors driving this behavior should be subject to further studies but one can hypothesize that stacked in such a manner (Fig. 1) the straw bales: 1) provide suitable shelter against predators and the elements, 2) probably create a favorable environment for invertebrates of great importance to the chicks and 3) the decaying of some bales generates heat which the birds may benefit from. Across its range, the Grey partridge is known to use farmstead areas with stored bales near them. Although the straw bale storage area somewhat resembles a traditional farmstead it is placed over large area far from urban territories and the birds within the study area managed to occupy the newly opened niche in less than three years after its appearance. Such behavior of the Grey partridge is expected during late autumn and winter but the present study show evidence for usage of the straw bale storage area by

the partridges during breeding season. This observation is important not as representative for Grey partridge population in the Thracian Plain, but as indication of the ecological plasticity of the species and the ability to adapt different types of land use in agricultural ecosystems.

Conclusion

Although our sample size was very small, the present study gives the first data about some ecological parameters of the Grey partridge for the South of Bulgaria. The estimated dispersion and home range size of the few monitored birds may indicate good habitat quality within the Upper Thracian Plain. The usage of unusual habitats by one of the tagged birds confirms the habitat adaptability of the grey partridge, which is well known for the species within its farmed environment but also indicated that such facilities may be of importance to the Grey partridge not only in autumn and winter but during the breeding seasons as well.

Authors' statement

The present study was conducted in accordance with the national legislation.

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