

FIRST RESEARCH AND RESULTS FROM SEMI NATURAL REARING OF ROCK PARTRIDGE (*ALECTORIS GRAECA GRAECA* (MEISNER, 1804)) IN BULGARIA

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Abstract

The aim of the study is to establish the breeding success of Rock partridge (*Alectoris graeca graeca* Meisner, 1804), rearing in semi natural conditions. In 2014, in the western part of Stara Planina Mountain, we built light demountable aviary for raising Rock partridge. The location of the cage falls within the natural range of the Rock partridge. They were placed in typical of the species habitats. In each aviary with an area as about 300 square meters 4 males and 4–5 females were settled. Of a total of 73 nests surveyed for the entire study period in 22 (30.1 %) of cases nesting was unsuccessful. In 54 cases, the bird chose artificial nests or built nests around the facilities of the aviary. In 19 cases they chose natural places to build nests. The average clutch size during the experimental period 2014–2017 was 8.4 ± 2.9 (2–13) (mean \pm sd. min–max). The hatchability was $74.3 \% \pm 10.3 \%$ (60–88.9 %) ($n=11$). The survival rate of fledglings to 90 days was 64.4 %. The breeding success was similar for wild Rock partridges. The average hatchability was higher than that recorded in captivity, but lower than in the wild.

Key words: clutch size, hatchability, hatchlings.

Introduction

Farmed birds released in the wild are killed within few weeks and the main reason for this is predation (Burger 1964, Hessler et al. 1970, Krauss et al. 1987, Robertson 1989, Parish and Sotherton 2007). Some authors explain the high losses in farmed birds with ethological, physiological and anatomical constrains that reduce their fitness compared to wild populations (Csermely et al. 1984, Paganin and Meneguz 1992, Putaala and Hissa 1995, Amici et al. 2017). The daily mortality rate of hand reared Rock partridges (*Alectoris graeca*

(Meisner, 1804)) directly put into the wild is 3–8 % of the released, with 52–84 % of the released birds dying within 21 days (Dessi-Fulgheri et al. 2001). A study performed on Gray partridges (*Perdix perdix* Linnaeus 1758) reported 50 % reduction in hatching in released birds compared to those from wild populations (Rands and Hayward 1987). Hand reared birds show losses in laying performances and eggs hatchability, due to ethological changes on the farm (Rands and Hayward 1987, Putaala and Hissa 1998, Parish and Sotherton 2007). In addition, the generation of farmed birds has higher losses and

less breeding potential than those in wild populations (Hill and Robertson 1988, Leif 1994, Brittas et al. 1992, Sage et al. 2003, Woodburn 2001, Meriggi et al. 2007). Hand reared Grey partridges showed higher mortality rate than those semi naturally reared or in the wild (Dowell 1990a, b; Buner and Schaub 2008). In partridge, it has been found that the birds breeding in semi natural conditions, tested with anti-predator techniques, have much higher levels of survival than farm ones (Slaugh et al. 1992, Alonso et al. 2005, Gaudioso et al. 2011, Sánchez-García et al. 2016). For Red-legged partridge (*Alectoris rufa* Linnaeus, 1758) Pérez et al. (2004) highlighted that its reintroduction is really difficult to perform starting from hand reared birds. The results of reintroduction of galliform birds, by release of hand reared into the wild, are with very various success. They usually associated with many long-term efforts that the release of a large number farmed birds (Ellis and Anderson 1963, Starling 1991, Panek 1988, Melin and Damange 2002, Meriggi et al. 2007). Many authors claim that the release of hand reared birds is not good practice to restore or increase wild populations of galliform (Sexson and Norman 1972, Roseberry et al. 1987, Panek 1988, Hill and Robertson 1988, Dowell 1990a, Brittas et al. 1992, Slaugh et al. 1992, Thaler 1986, Perez et al. 2004, Alonso et al. 2005).

In Bulgaria, attempts to hand rear Rock partridges started in the late 1960s but results consisted in low clutch size (6–8 eggs per hen) and hatchability (Dilovski and Chavdarov 1974, Bubarsky and Todorov 1988). In the 70s and 80s a crossbreeding between the two species of genus *Alectoris* (*chukar* and *grae-ca*) started with no particular success in clutch size and hatchability (Dilovski and Chavdarov 1974). All such attempts to

raise Rock partridges and their hybrids in farms ended in the middle of 1990s due to low hatching and high bird mortality.

The aim of the study is to evaluate the breeding success of Rock partridge, reared in semi natural conditions.

Materials and Methods

The experimental breeding program and four aviaries of 300 square meters were built in sites included in the natural distribution range of the species. Each aviary was circular, 1.6 m high at the edges and 4.5 m in the center. The sites of each aviary were consistent with the characteristics of the habitats according to Simeonov et al. (1990) and the significant environmental factors (Amici et al. 2009) as far as possible. Around the aviaries, wild Rock partridges have been observed. The purpose was the aviary conditions to be close to those in the wild. All aviaries were in the same conditions of the weather and habitat, located alongside and with west exposure. In each aviary, rocks occupy 15–30 % of the area and there were natural shelters (20 %) offering nesting sites. In addition, 2 artificial shelters and 4 nests were built in each aviary to increase the supply of nesting places. The nests were classified according to the place in the aviary in artificial, and shelters and natural nests built in different parts of the aviaries. In 2015 was built another aviary, identical to the previous ones. In each aviary, 2 males and 3 females were placed at density of 1 bird/60 m². After 2015 we put 4 males and 5 females at density of 1 bird/33 m².

Mating birds came from two farms in Central and Northern Greece. They were taken at the age of 5 months in September 2013 and transferred to the aviaries.

In 2015, 3 male Rock partridges captured from wild population, integrated into the stock of mating birds of Vrachanski Balkan Nature Park.

The nest success was determined as a number of clutches that produce young to the total number of clutches (Murray 2000). The clutch size was determined as the mean number of eggs from nests with brood females. There were not included nests with 1–3 eggs subsequently abandoned. The hatchability was calculated as a percentage of hatched eggs to the total number of eggs laid. The survival rate of fledglings was determinate as a percentage of number of 90 days young birds to the number of fledglings.

Eggs from abandoned nests and nesting out were collected and measured. The maximum length and width was measured with caliper, and weigh with a scale accuracy of 0.01 g.

Results

For the entire study period, 29 artificial nests were used, in 25 cases the birds built nests under the sheds of the feeders. There were also 19 nests in different parts of the aviary: 6 nests in rock crevices; 7 under bushes and 6 in high grass vegetation, most commonly under the Hellebores (*Helleborus odorus* Linnaeus, 1753).

The Rock partridge preferred artificial nests and facilities for building them accordingly, nesting success was higher than with the nests in other places of the aviary ($\chi^2=3$, $p=0.04$) (Fig. 1).

The results for all studied nests are shown in Table 1.

Of a total of 73 nests observed, during the study period, 22 (30.1 %) of the cases were with unsuccessful nesting. Six nests (27.3 %, $n=22$) were destroyed by reptiles; 6 nests (27.3 %, $n=22$) were de-

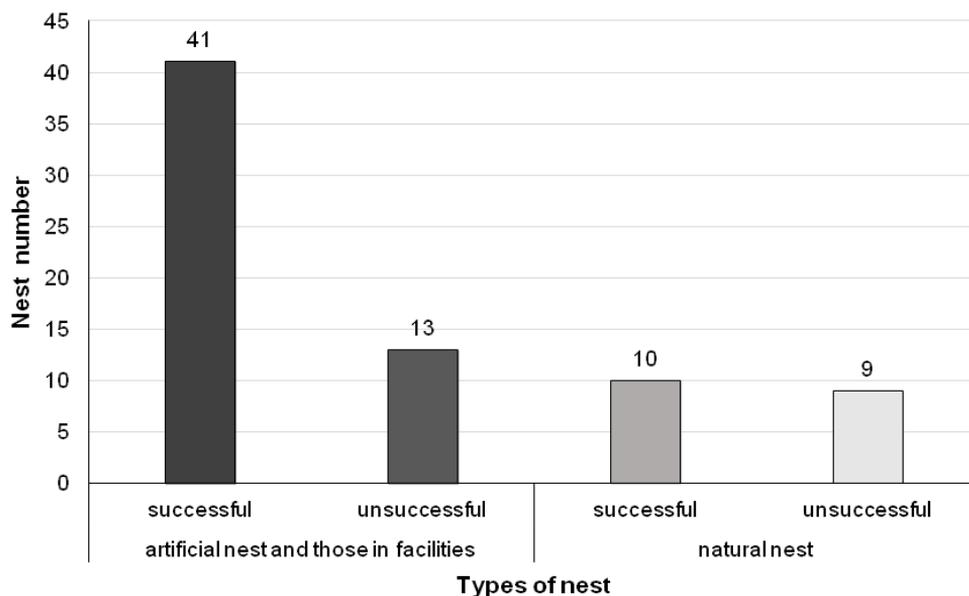


Fig. 1. Nests by place and success of nesting.

stroyed by strong storms and in 10 cases (45.4 %, $n=22$) we were unable to establish the reasons for abandonment of the nests, but all 10 were with 1 to 3 eggs. We had 51 successful nesting's for the survey period and nesting success was 69.9 %.

Table 1. Observed nests and causes for destroying.

Year	All number of nests	Destroyed, number	Reptilian	Abandoned nest
2014	6	3	1	2
2015	22	11	2	9
2016	21	4	1	3
2017	24	4	2	2
Total	73	22	6	16

The first laid eggs were observed from the second half of April to the beginning of May (07.05.2014, 09.05.2015, 01.05.2016, 19.04.2017). The laying period was about 20 days, one egg in 1–3 days. The incubation period was 25–27 days.

The average length of eggs was 41.06 ± 1.57 (37.54–45.16) mm; the width 30.76 ± 1.08 (28.64–33.11) mm; weight 21.19 ± 1.88 (17.4–25.5) g ($n=113$).

The mean clutch size was 8.4 ± 2.9 (2–13) eggs (mean \pm std.; min–max). One clutch was with 16 eggs, but 2 females were found in it. The first hatchlings were observed on June 2, 2014 at 9:30 am from a nest of 8 eggs (6 hatchlings). In the following years, the first hatchlings were observed on 08.06.2015, 16.06.2016 and 09.06.2017. The average hatchability was $74.3 \% \pm 10.3 \%$ (60–88.9 %) ($n=11$). Mean survival rate of fledglings, up to 90 days was 64.4 ± 4.3 (60–70 %).

Discussion

In this study, Rock partridges use more often artificial nests and those in facilities than natural vegetation and rocks. Figure 1 shows the larger number of observed nests in facilities than the other parts of the cages. Perhaps one of the reasons for this could be the lack of sufficiently suitable natural nesting sites in the aviaries. Successful nesting was found in 69.9 %. These data are similar that reported by some authors for wild populations (Vavalekas et al. 1993, Bernard-Laurent et al. 2017). In some cases, the cause of losses was reptiles and storms. Vavalekas et al. (1993) also reported similar observations in wild populations. The last authors also point out the abandoned nests, for which the reason was obscure have a small number of eggs. The rainfall rate in the second half of July is the significant factor after the average temperature in the first half of June for the nesting success of Rock partridge in the Alps (Giordano et al. 2013). The aviaries in which the birds are bred are 1233 m a.s.l. and often in the spring there are extreme temperatures and heavy rains. We believe that one of the reasons of the recorded losses should be the extreme conditions at certain days during the incubation period. In case of lower altitude aviary with predominance of southern and southeast slopes, the results would probably be better.

The mean clutch size found in this study was slightly lower than the one known in wild populations. About Bulgaria Simeonov et al. (1990) reported an average number of eggs 12–15, for northern Greece authors indicated 12–18

(Vavalekas et al. 1993) and 7–14 for the Alps (Bernard-Lauren et al. 2017). The lower clutch size is probably due to differences in environmental factors or the effect of aviary and breeding density.

The average hatching rate in the present study was 74.3 % and is slightly higher than that of the farm ones (Kirikci et al. 2004) but is lower than that reported for the native population in Northern Greece – 90.8 % (70.6–100 %) (Vavalekas et al. 1993) and in Southern French Alps – 91–92 % (Bernard-Lauren et al. 2017). Egg sizes and weights measured in this study overlapped with known for Rock partridge (Simeonov et al. 1990, Vavalekas et al. 1993, Kirikci et al. 1999, Kirikci et al. 2004). The present study found higher hatchability compared to hand reared Rock partridges.

Conclusion

In this study, Rock partridges used more often artificial nests and those in facilities than natural vegetation and rocks. One of the reasons for this could be the lack of sufficiently suitable natural nesting sites in the aviaries. The mean clutch size and hatching rate was lower than that reported for the native population but the nest success is similar to the wild. Probable cause is the effect of aviary or density of the birds. This study showed an alternative way of breeding Rock partridges compared to farming but further research is needed.

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