National Quail Symposium Proceedings

Volume 6 Article 41

2009

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Francis Buner
Swiss Ornithological Institute

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Francis Buner[1,2]

Swiss Ornithological Institute, 6204 Sempach CH
Zoological Institute, University of Basel, Rheinsprung 9, 4001 Basel CH

Once a widespread farmland bird in Switzerland, the Gray Partridge (*Perdix perdix*) has declined drastically since the 1960's as a result of agricultural intensification and changes in predator abundance. In 1991 the wild population had dropped to ≈17 pairs only. We initiated a reintroduction experiment of Gray Partridge to investigate its feasibility for conservation of the species in Switzerland. Between 1998 and 2001 we released 145 partridges in the Swiss Klettgau, an intensively cultivated area from which the species had become extinct in 1993, but had since been ecologically enhanced with wild-flower strips and hedges up to 5.8% of the available habitat in the release area (≈530ha). Although the duration of the study was too short to prove if further partridge re-introductions in Switzerland or abroad will be successful in terms of creating self-sustainable populations, it is possible to draw four basic conclusions for future partridge re-introduction projects: 1) prior to every partridge re-introduction or re-establishment the habitat must be enhanced with permanent habitat structures, 2) if translocated wild birds are not available for release, chicks should be fostered whenever possible to increase their survival, in the best case to wild birds still resident in the area, 3) reintroductions should only be envisaged in areas with low predator numbers and human activities, 4) in order to find possible weaknesses in re-introduction projects, post-release monitoring is essential to ensure the project targets are met.

Citation: Buner F. 2009. How to re-introduce gray partridges - conclusions from a releasing project in Switzerland. Pages 391 - 395 in Cederbaum SB, Faircloth BC, Terhune TM, Thompson JJ, Carroll JP, eds. Gamebird 2006: Quail VI and Perdix XII. 31 May - 4 June 2006. Warnell School of Forestry and Natural Resources, Athens, GA, USA.

Key words: disturbance, gray partridge, habitat enhancement, habitat use, parent fostering, *Perdix perdix*, re-introduction, survival, Switzerland

Introduction

In the last forty years, the Swiss lowlands have lost much of their former value as habitat for wild plants and animals, mainly because of the effects of modern farming practices. One of the most prominent and charismatic species affected is the Gray Partridge (*Perdix perdix*). Once a typical farmland bird with a spring population in the 1960's of about 10,000 individuals, its numbers have declined sharply since (Schmid et al. 1998). Considering the alarming decline of the Gray Partridge, the Swiss Agency for the Environment, Forests and Landscape (SAEFL) entrusted the Swiss Ornithological Institute in 1991 to undertake a ten year project on "Protection measures for Brown hare and Gray Partridge" (see also Jenny et al. 2002). In this context the "Klettgau" in the canton of Schaffhausen was chosen as study area as it was one of the two regions in Switzerland where wild partridges still remained in small numbers at that time. To reverse the main cause of the partridge's decline - habitat loss (e.g. Potts 1986) - the main activity in the early stages of the project was the promotion of ecologically enhanced habitats such as wild-flower strips and hedges. Unfortunately, the already very small partridge population went extinct shortly after the beginning of the project. However, by 1998 the area of partridge-friendly habitats had grown to such an extent that itallowed us to start a reintroduction experiment. This was undertaken as part of the Swiss Ornithological Institute's project "Birds as test organisms to evaluate enhanced habitat diversity in agricultural areas" which started in 1996. This project became part of the interdisciplinary research program "Integrated Project Biodiversity" launched by the Swiss

[1]**Correspondence**: fbuner@gct.org.uk
[2]**Current Address**: The Game & Wildlife Conservation Trust, Fordingbridge, Hampshire, SP6 1EF UK.

National Science Foundation. The main aims of the re-introduction project were to assess whether Gray Partridges 1) are able to survive and reproduce in an ecologically enhanced landscape such as the Klettgau, 2) make use of the enhanced areas and, if so, which value they have for them, 3) are disturbed by human and predator activities within the re-introduction area.

This paper summarizes the results of the project published elsewhere (Buner et al. 2005, Buner and Schaub 2008, Buner 2006) and concludes on their basis if and under what conditions further partridge re-introductions in Switzerland and abroad might be successful.

Study Area

The study was conducted in the intensively cultivated arable region Klettgau near Schaffhausen, Switzerland (430 m a.s.l.), where mainly cereals (49%), oil-seed rape and sunflowers (14%) and root crops (12%) are grown. Grassland covered 11%, another 11% were bare of vegetation (buildings, roads, etc). Permanent cover such as wild-flower strips, hedgerows and grass banks amounted to 3% of the area. Field sizes ranged from 0.1 to 5.5 ha. The study area was c. 530 ha in size. From 1991 to 2001 the area of wild-flower strips increased from 0 ha to 12 ha, the area of hedgerows from 2 ha to 2.7 ha. Wild-flower strips were narrow strips of 6-20 m width along field edges and were maintained for at least six years. They were initially sown with a mixture of c. 30 wild plant species, however, a total of 234 plant species were recorded in the wild-flower strips in the research area (Ullrich 2001). Besides agricultural use, the study area is very popular for recreation mainly by walkers with or without dogs and riders. In the centre of the study site there is a dog training school and an arena to school horses, in the northern part of the area there is a cycling route. For further description see Buner et al. (2005).

Methods

From 1998 to 2000 we released a total of 142 partridges in the study area, all genetically originating from the western clade of the subspecies *Perdix perdix perdix* (see Liukkonen-Attila et al. 2002). Originally it was planned to release wild translocated birds only (50 per year) as it is well known that this technique generates the highest possible re-introduction success. After the first year of this study however, it became apparent that it was impossible to organize enough wild-caught birds for release (n = 33 released in total). We therefore had to switch to the next most promising option which I considered to be parent-reared birds released as coveys in autumn (n = 77). In the second and third year of this study we additionally fostered parent-reared chicks (n = 32) to already re-established adult birds which had failed to produce their own young. Each radio-tagged bird was located at least once every week until it was found dead. For detailed descriptions of the origin of birds released, releasing techniques, transmitters, data collection and catching techniques used, see Buner et al. (2005) and Buner and Schaub (2008).

Results

Dispersal, survival and causes of death

Of 110 released and radio-tagged adult partridges (33 wild translocated, 77 parent-reared), 73% remained within the study area and 52% survived the first month after release. During the first month after release, they frequently moved across the whole research area. After settling, 98% of all partridge locations were recorded in that part of the study area where the density of enhanced areas was maximal.

Monthly survival was highest in wild-hatched partridges of the founder population (mean $\pm$ SE; 0.90 ± 0.03), followed by that of fostered chicks (0.86 ± 0.03) and translocated adult wild birds (0.82 ± 0.06). While survival of these groups was not statistically different from each other, survival of captive-reared adults was significantly lower (0.70 ± 0.06). We found the carcasses of 91 partridges; 88 of them were predated, 1 died because of disease, 1 because of a traffic accident and 1 as a result of a territorial fight. Predation by mammals (mainly foxes) was

twice as frequent as predation by avian predators. (For more details see Buner and Schaub 2008).

Reproductive success

We radio-monitored 19 pairs that started egg laying, as all other birds released were either predated before the breeding season started or dispersed (see above). Of those 19 broods, seven hatched and twelve failed (11 predated, 1 disturbed). Mean clutch size of first clutches was 15.3 eggs (n = 9 clutches, SE = 0.27). Only one replacement clutch was found. 86% of all eggs hatched (n = 7 broods, of which an avg. of 6.43 (SE = 1.86) juveniles per brood survived until October). The average percentage of successful nests over three years was only 0.33 (SE = 0.08). When breeding the year after release, fostered chicks tended to have more successful nests (0.44 [SE = 0.43]) than when individuals of the other treatment groups were involved (reared adults: 0.17 [SE = 0.03]; translocated: 0.25 [SE = 0.07]; wild hatched in study area: 0.27 [SE = 0.29]), but the differences were not statistically significant due to low sample sizes (χ^2_3 = 0.68; P = 0.88, Generalized linear mixed model with a binomial error and the brood identity as random factor). Eleven out of 19 nests were located in wild-flower strips.

Habitat use and home range size

At the level of the individual family group (pairs or coveys), we found a significantly greater use (throughout the year) of habitat areas that were enhanced with wild-flower strips and/or hedges, compared to non-enhanced areas. When the birds used the agricultural fields, densities of use declined sharply with increasing distance from the nearest enhanced area. Thus, the availability and spatial distribution of ecologically enhanced areas were the main determinants of the partridges' range use. Despite their strongly over-proportional use of enhanced areas, the partridges spent a large proportion of time in cultivated fields. In summer, frequently visited vegetation types were cereals (average 26.1% of locations), root crops (14.8%) and grassland (9.3%). In winter, the birds spent much of their activity in cereals or stubble fields (32.7%) and rape (24.1%). This indicates that these types of vegetation, particularly cereals, were attractive resources, although not preferred in respect to their availability.

The size of the group home-ranges varied significantly with season. In spring (pre-breeding period) and summer (breeding period), the average home-ranges ($\pm$ SD) were 6.8 ($\pm$ 4.0) ha and 6.9 ($\pm$ 2.6) ha, respectively. From late summer until the end of winter (non-breeding period), the home-ranges were significantly larger (late summer: 15.2 ($\pm$ 6.6) ha; autumn: 17.0 $\pm$ (4.0) ha; winter: 14.4 ($\pm$ 3.6) ha). For more details, see Buner et al. (2005).

Disturbance

Partridges showed a distinctive cause-specific reaction repertoire to all disturbance types compared, mainly crouching in presence of raptors and showing vigilance in presence of mammals (foxes and cats). Flushing was the main reaction when disturbed by leisure activities. When flushed, partridges reduced their flight distance by 54 metres compared to unforced flights and remained in their territory in 87% of all cases. In summer, their main escape cover was cultivated fields, whereas in winter they mainly used permanent cover such as wild-flower strips and hedges. The spatial distribution of partridges was influenced by season: In summer, partridges avoided areas with high human disturbance, whereas in winter they avoided areas with high predator abundance and close proximity to tall hedges. Human activities caused twice as much disturbance events as predators, with associated energetic costs. Overall, disturbance substantially limited overall spatial use, with consequences for the carrying capacity of the area.

Discussion

Despite the best efforts of Swiss agricultural policy and millions of Swiss Francs spent on enhancing agricultural biodiversity, the Gray Partridge, a key farmland bird species, has shown no sign of recovery to the present day. Indeed, the last truly wild partridge population in Switzerland in the Champagne genevoise became almost extinct during the time of this study (3 birds left in 2004). Much more

effort is needed therefore, to save the Gray Partridge which depends on high quality habitat enhancement in the right places and in substantial proportion of the available habitat supply (for more details see Buner et al. 2005). To save species like the Gray Partridge, carefully planned projects which bring together various stakeholders such as farmers, population biologists, conservationists, game keepers, people from the local, regional and national government, local nature conservation groups and the press are necessary. The results of this re-introduction project in the Klettgau show that with enough staying power, even the intensively exploited Swiss countryside may provide a suitable environment for highly demanding species such as the Gray Partridge. Even though it is not possible to prove from this study's results whether further partridge re-introductions in Switzerland or abroad will be successful in terms of creating self-sustainable populations (to do so, long term experiments with more birds involved are necessary) it is possible to draw four basic conclusions for Gray Partridge re-introduction projects:

1. Prior to every partridge re-introduction or re-establishment project the habitat must be enhanced with permanent habitat structures. Wild-flower strips and low, if possible treeless hedges are highly preferred by partridges as they provide nesting, brood rearing, foraging and escape cover during all seasons.

2. If translocated wild birds are not available, the most efficient releasing technique is fostering chicks to pairs which failed to hatch their own young. In the best case, chicks are fostered to wild birds still resident in the area. Where no such birds are left, captive parent-reared adults should be released as coveys in autumn with maximum support to allow successful settlement, followed by fostering chicks the following summer. Giving the system enough time to develop, a carefully planned releasing regime should allow a population of well experienced individuals to establish in a relatively short time.

3. To enhance the chances of re-introduction success, areas should be chosen with low predator numbers and human activities, especially leisure activities, or managed specifically to reduce those sources of disturbance. Predators and human activities do not only have direct impacts on survival and breeding success but may also reduce the available area for foraging and therefore the carrying capacity of an area as a whole.

4. Sustained post-release monitoring should check for winter mortality, nesting success and chick survival over time. At least one spring and autumn count should be carried out to assess population development of the released birds. In order to find possible weaknesses in a re-introduction project, knowledge of the most important population parameters are essential in order to ensure the project targets are met.

Acknowledgments

This study is part of the author's PhD thesis and was supervised throughout by Prof. B. Bruderer. Particular thanks are owed to I. Steiner, M. Nuber, E. Schumacher, H. Gamper, P. Kehrli, L. Bruderer, S. Liersch and L. Filli for their assistance in collecting the data. I am also grateful to N. Zbinden and N. Aebischer for valuable comments on the manuscript. The Swiss National Science Foundation (SNFS Grant no. 5001-044639) supported the project within the framework of the Integrated Project Biodiversity.

References

Buner, F. 2006. Survival, habitat use and disturbance behaviour of re-introduced grey partridges (*Perdix perdix*) in an enhanced arable landscape in the Swiss Klettgau. Ph.D. thesis, Unpublished, Swiss Ornithological Institute, Sempach, CH.

Buner, F., M. Jenny, N. Zbinden, and B. Naef-Daenzer. 2005. Ecologically enhanced areas - a key habitat structure for re-introduced grey partridges (*Perdix perdix*). Biological Conservation 124:373–381.

Buner, F., and M. Schaub. 2008. How do different releasing techniques affect the survival of reintroduced grey partridges? Wildlife Biology 14:26–35.

Jenny, M., U. Weibel, B. Lugrin, B. Josephy, J.-L. Rregamey, and N. Zbinden. 2002. Grey partridge final report 1991-2000. Bern. Publication 335, Swiss Agency for the Environment, Forests and Landscape (OFEFP).

Liukkonen-Attila, T., L. Uimaniemi, M. Orell, and J. Lumme. 2002. Mitochondrial DNA variation and the phylogeography of the grey partridge (*Perdix perdix*) in Europe: From Pleistocene history to present day populations. Journal of Evolutionary Biology 15:971–982.

Potts, G. R. 1986. The partridge: Pesticides, predation and conservation. Collins, London, UK.

Schmid, H., R. Luder, B. Naef-Daenzer, R. Graf, and N. Zbinden. 1998. Atlas of the breeding birds of Switzer-land and Liechtenstein (in German and French). Swiss Ornithological Institute, Sempach, CH.

Ullrich, K. S. 2001. The influence of wild-flower strips on plant and insect (Heteroptera) diversity in an arable landscape. Ph.D. thesis, ETH No. 14104, Zürich, Zürich, CH.