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SURVIVAL OF SPRING RELEASED, HAND REARED COMMON PHEASANTS (PHASIANUS COLCHICUS COLCHICUS L. 1758) AND CHUKAR PARTRIDGES (ALECTORIS CHUKARJ. E. GRAY, 1830) IN NATURAL HABITATS IN BULGARIA

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*Summary:*Survival and adaptation in the wild of the farm game birds are the most important indicators for the game breeding success. Spring release of hand-reared Common pheasants (*Phasianuscolchicus* L., 1758) and Chukar partridges (*Alectorischukar* Gray, 1830) is a powerful tool to increase the breeding potential and the growth rate of population. However, the process is complicated and depends to a large extent on the preservation and development of birds' wild instincts, proper breeding and dispersal, habitat selection and the period of releasing.Survival of 20 Common pheasants and 49 Chukar partridges, spring released in natural habitats in Bulgaria, was estimated using radio-telemetry. Pheasants were released in March 2011 and Chukars – in February to May 2010.During the first eight weeks after release 80% of Pheasants and 83.67% of Chukars died. Chukars survival rates did not depend on the method of releasing. Pheasants and Chukars survival rates did not differ, but Pheasants dispersion was lower. The highest mortality rates occurred in the first 2 weeks after releasing.

Key words: survival rates, radio telemetry, farm birds, pheasant, chukar partridge

Introduction

Placed in a market economy, the game farming must prove and enforce its environmental and economic effectiveness. The major flaws must be overcame for the purpose: wild instincts dulled and suppressed wild habits, low survival rates and high mortality after releasing, with high production costs and expensive game birds. The game farming is uninterrupted process of production, rearing, release and harvest,which requires an objective analysis and evaluation of the effectiveness of the entire process. Effectiveness is expressed not only with the rate of harvest compared to the birds released, but also by maintenance of sustainable natural populations. Regardless of the various objectives, the survival of the birds produced in game farms is fundamental for the whole process.

The data concerning the number of birds released, survival rates, population size and harvest of chukar partridges (*Alectoris chukar*, J.E.Gray, 1830) and pheasants (*Phasianus colchicus colchicus* L. 1758) in Bulgaria for the last years are worrying. The harvest rate was too low even compared only to the number of released birds. The chukar partridge hunting bag varies between 7–11 % of the birds released at the beginning but drops to zero in the last years (average about 5 % for the period of 8 years).

There is a lack of any effectivity for the whole process. Actually in the natural habitats of the chukar partridges in Bulgaria (Sliven, Yambol, Kardzali, Haskovo and Stara Zagora districts) there is no harvest in the recent years despite releasing of many birds in the wild. The only exception being the birds which were hunted directly after release through organized hunting tourism. Hence, the game farming efficiency, expressed by the chukar partridge harvest rate, significantly decreased despite releasing of birds into the wild. The pheasant harvest rate was also very low – about 23 % compared to the released birds. It could be lower compared to the spring population size plus numbers of released birds, but if only the hunting records were reliable. Such a harvest rate was hardly and almost impossible to be determined because the population size and hunting bags of chukar and rock partridge and also different subspecies of pheasant were not recorded separately.

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The disturbing results mentioned, showing very low total efficiency of the overall process, forced some hunting associations to switch to spring release of birds in small numbers in order to achieve a higher density during the breeding season, and thus higher growth rate with lower costs and higher efficiency. Such releasing was supported financial by functioning of the National program for breeding and releasing of farm game in Bulgaria. In the 2010–2014 e.g. 9000 chukar partridges and 9200 pheasants were released in spring in typical habitats in Southern Bulgaria (Union of hunters and anglers in Bulgaria (UHAB) – official data). The birds winter in farms winter yards and in early spring are provided to the hunting associations for releasing. Whether the practice gives positive results in these two species is of particular importance. Special interest raises the conservation of wild instincts and habits during the long stay of the birds in the farm, and also their survival and participation in reproduction. The hunting practices and methods of rearing and releasing are also of great importance. The main topic however is the birds' survival and reproduction in the wild, which is the primary goal of the spring release.

The aim of the study was to determine the survival of farm chukar partridges and common pheasants, released in the spring, before breeding season, the effectivity of methods of rearing and releasing, preserving of wild instincts and habits of protection and survival, causes of mortality, and spring release efficiency as a whole.

Material and methods

The survival rates of reared and released pheasants and chukar partridges was studied by using radiotelemetry. Altogether 49 chukar partridges and 20 pheasants were released during the period 2010-2011. The birds wintered in winter yards in the open in the game farms. They were released in typical habitats where wild birds were available even in low density. The chukar partridges had been released from February to April 2010 in three different hunting ranches using three different methods – rearing in aviary in the hunting area, in adaptation cage, and direct release after transport in the area. Pheasants were released in March 2011 directly after delivering in the area without any rearing, which is the usual practice of hunting associations. Every bird was marked with individual radio-transmitter emitting a signal with a frequency in the range of 216-219 MHz. Thus, each individual could be differentiated in the field. The radio-transmitters weigh 10 g and satisfy the requirement not to exceed 3 % of bird's weight (Withey et al. 2001). The signals were received using the radio receiver with antenna operating in the same range. The field work, birds' locations and following of their survival rate were carried at least once a week for 8 weeks after release. The causes for mortality were separated in 4 groups – mortality caused by carnivores, birds of prey, human activities and unidentified. The cause of death of the birds was found on the trails left by the transmitter and analysis of the remains of feathers and bones around it. Locations of dead birds and tracks around them were also analyzed. The exact location of each bird after release was determined by GPS receiver using Garmin Mobile XT software.

Differences in dispersion after release were tested by Kruskal-Wallis test. Survival rates were estimated using Kaplan-Meier nonparametric analysis or product-limit estimator (Kaplan and Meier 1958, Pollock et al. 1989) and parametric survival curve analysis with Weibull distributed errors (Pinder 1978, Crawley 2013). The differences in survival rates between birds released using different methods and the interaction between method of release and sex of birds were tested by log-rank test (Krebs 1999), Cox proportional hazards model (Cox and Oakes 1984) and parametric model with Weibull errors (Pinder 1978). A parametric survival curve analysis is less subject to the sensitivities of small sample sizes and stochastic variability observed in the Kaplan-Meier nonparametric analysis (Skalski et al. 2005). All statistical analyses were performed using *R* (*R*Core Team 2014) and package *survival*, v. 2.37-7 (Therneau and Grabsch 2000, Therneau 2014).

Results

The released birds stayed in the area of releasing with dispersion below 1 km (Table 1). There are no significant differences in the dispersion of chukar partridges in the three different study regions with different releasing methods used ($H = 5.586$, $df = 2$, $p = 0.061$). The pheasants stayed closer to the point of releasing than chukar partridges ($H = 4.98$, $df = 1$, $p = 0.026$).

The most birds died in the first 2-3 weeks after release. Kaplan-Meier survival rate was about 20 % at the end of study, no matter what species or method of releasing was used (Figure 1).
Chukar partridges were released by using three different methods. There are differences in survival rates between birds that were reared in aviaries and those released direct and reared in cages (χ^2 = 6.91, *df* = 2, *p* = 0.032). Birds reared in aviaries survived no more than 4 weeks, while direct released chukar partridges and reared in cages before releasing lived at least twice longer and about 20 % were still alive at the end of the experiment (Figure 2).

Table 1. Dispersion of birds after releasing.

Species	Method	Dispersion, m			
		$\bar{x}$	*S*	Min	Max
Alectoris chukar	aviary	670	850	60	3500
Alectoris chukar	cage	810	500	140	1900
Alectoris chukar	direct	570	660	60	3200
Phasianus colchicus	direct	540	240	40	3300

Data are rounded to the nearest 10 meters according to the GPS device accuracy.

The Cox's proportional hazards model showed that the interaction between method of releasing and sex of chukar partridges was significant only if the birds were reared in cages (*z* = 2.19, *p* = 0.028). The parametric model with Weibull errors gave the same results (*z* = -2.41, *p* = 0.015). The mean survival time of males was twice shorter than that of females. (χ^2 = 5.56, *df* = 1, *p* = 0.018). All male birds died until the end of sixth week while 50 % of females survived at the end of the experiment. There were no differences between males' and females' survival rates when other methods of releasing were used.

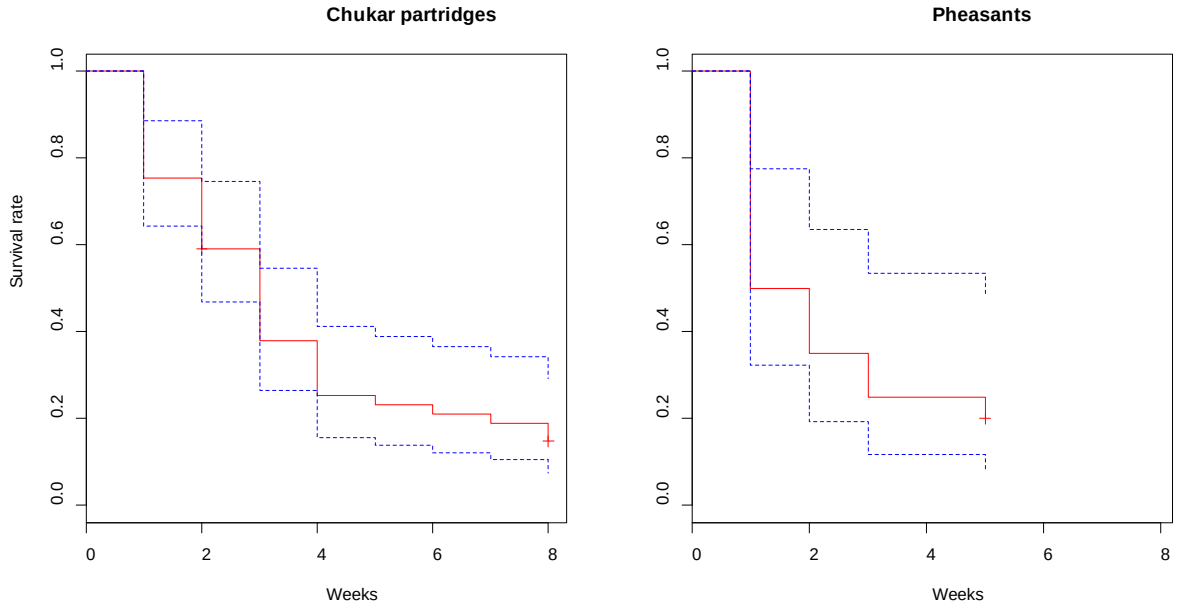

Figure 1. Kaplan-Meier survival rates of chukar partridges and pheasants. Dashed lines show the 95 % confidence interval limits. Plus sign shows the presence of censored individuals.

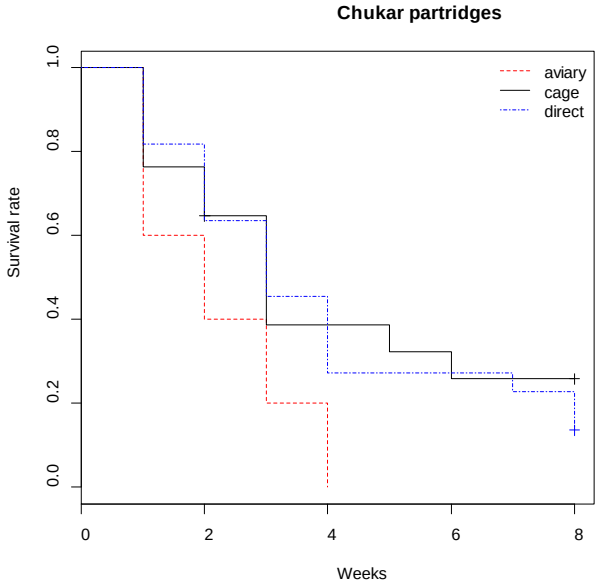

Figure 2. Kaplan-Meier survival rates of chukar partridges released in the wild by using different methods. Plus sign shows the presence of censored individuals.

Pheasants were released directly in the wild. No differences were found comparing survival rates of pheasants and directly released chukar partridges ($\chi^2 = 1.7$, $df = 1$, $p = 0.171$, Figure 3). The survivorship of pheasants did not depend on the sex of birds ($\chi^2 = 0.9$, $df = 1$, $p = 0.331$).

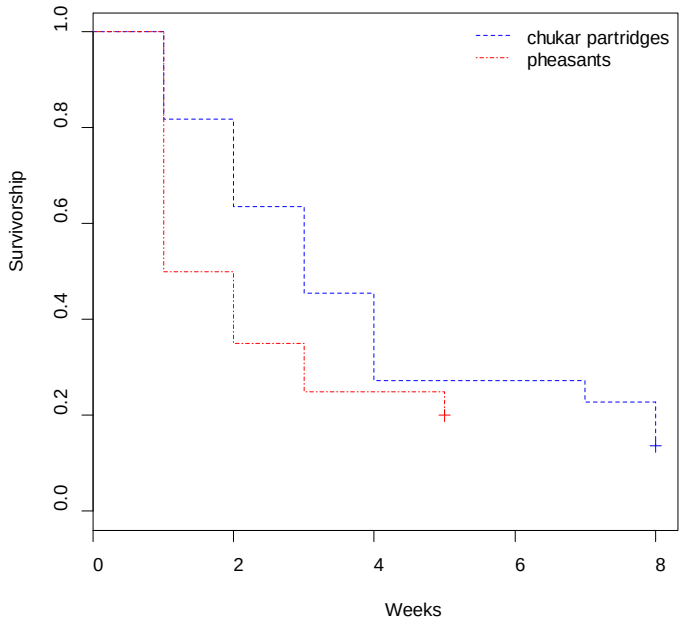

Figure 3. Kaplan-Meier survival rates of directly released in the wild chukar partridges and pheasants. Plus sign shows the presence of censored individuals.

The main reason for mortality of birds in most cases were predators. Above 50 % of pheasants (10 birds, $n = 16$) were killed by carnivores and about 30 % (5 birds) by humans. From the carnivores mainly foxes attacked the pheasants (3 birds) and once golden jackal was spotted near the carcass of dead pheasant. No birds of prey were found to attack the pheasants. About 80 % of chukar partridges were killed by carnivores (33 birds, $n = 41$), 10 % (4 birds) by birds of prey and only 1 bird was killed by humans. In some cases it

was possible to determine the species that caused damages. Wild cats attacked and killed 6 birds, Mustelidae – 3 birds, red foxes – 2 birds and domestic dogs – 2 birds. Two chukar partridges were killed by goshawk and one bird was found in the imperial eagle's nest. The exact identification of the predator was not possible in other cases.

Discussion

Above 50 % of birds died in the first 2-3 weeks after release. The same results were also received with pheasants (Robertson 1989) and other farm birds (Brittas et al. 1992Leif 1994, Petrini et al. 1995,Sage et al. 2001, 2003,Venturato et al. 2001).

The differences in survival rates of chukar partridges, released by using of different methods, do not change the main conclusion – the spring release effectiveness was very low, no matter of the methods of releasing. The shorter survival time of male chukar partridges, which was significantly different only for one of the methods of release, probably was due to higher activity of displaying males in the beginning of the mating season. More active males are more vulnerable to predation.

The results showed very low survivorship of spring released farm birds, pheasants and chukar partridges, no matter of the method used. Only 20% of the birds survived at the end of the study, but that still does not mean that the adaptation of these birds was successful. The results are similar to studies of many other authors about survival of the released farm produced game birds (Duarte and Vargas 2004, Duarte et al. 2010). But what are the reasons for the low survival rates? Although in most cases birds were killed by carnivores, the main conclusion could not be that the carnivores were the main reason for these results. Losses from predators in the wild birds are far lower, indicating that farm birds do not adapt quickly enough to the natural environment after releasing. Some authors explain the higher losses of partridges with ethological, physiological and anatomical limitations that reduce their fitness compared to wild birds (Csermely et al. 1984, Paganin and Meneguz 1992, Putaala and Hissa 1995). Others have found lower rates of mortality and statistically insignificant differences in mortality of farm and wild pheasants, explaining that with changing the rules of bird production and release (Bagliacca et al., 2008).

Causes of poor results in the spring releasing can be found in several directions. An important factor for increasing domestication of birds and their difficult adaptation after the release is the inbreeding in parent stock. Since the establishment of the chukar partridge farm in 1985 the gene pool of birds had not been refreshed. The genetic diversity in previously established pheasant farms in Bulgaria was also very low. The parent stocks used were hatched in the same farms. No eggs were imported from other regions or from wild birds collected in the wild. Perhaps this leads to a change in the birds' behavior and in breeding, which significantly lowers the quality of the chukar partridges and pheasants.

The poor quality of farm birds sometimes is due to large densities, where the birds are kept in farms and use of feed with low protein content. This also leads to diseases and infestation, poor plumage and loss of game instinct.

One of the main factors for the poor performance of the spring releasing is probably the long stay of the birds in the farm, where the domestication processes advance. The birds have no fear from people, lack of opportunity to findnatural food,slow recoveryofthe instinct ofself-preservation and their adaptation in nature after releasing is moredifficult.These birds are not able to escape from predators and become easy prey. Radio-telemetry studies ofr ock partridge in the French Alps show that predation is the main cause for mortality (Bernard-Laurent 1989).

Despite the cons, the spring release has some pros. Spring released pheasants and chukar partridges are not inclined to migrate. All birds stay in the area of releasing. However, the low efficiency of this releasing does not allow to be recommended as the primary method for populating hunting grounds with game birds. The birds used for spring release are more expensive, without preserved game instinct. They are much easier prey and very few of them survive in the wild. Therefore the spring release proved to be inefficient and ineffective.

Still the use of farm produced birds is reliable way for wild bird populations' recovery (Nadal 1992, Carvalho and Borralho 1997). But the correct methods and high quality farm birds have to be used. Habitat quality also plays an important role in the survival of released birds and their interactions with wild populations. The genetic diversity of the released birds should not be underestimated (Duarte and Vargas 2004).

The survey confirmed the need for a professional, consistent and comprehensive approach to the process of farm birds breeding – production, rearing, releasing and harvesting. No stage or element in the overall cycle can be underestimated and overlooked. Ecological principles and practices of game farm breeding will dominate and define technological approaches and economic indicators.

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References

1. Bagliacca, M., Falcini, F., Porrini, S., Zalli, F., Fronte, B. (2008) Pheasant (*Phasianus colchicus*) hens of different origin. Dispersion and habitat use after release. *Italian journal of animal Science*, 7, 321-333.
2. Bernard-Laurent, A. (1989) Importance de la predation surune population de perdrix roch assieres (*Alectoris graeca saxatilis x Alectoris rufa rufa*) des Alpes Meridionales. *Gibier Faunesauvadge, dec.*, 361-382.
3. Brittas, R., Marcstrom, V., Kenward, R., Karlbom, M. (1992) Survival and breeding success of reared and wild ring-necked pheasants. *Journal of Wildlife Management*,56,368-376.
4. Carvalho, J., Borralho, R. (1997) Crescimento populacional e successo reproductivo de duas populaces de perdizvermelha (*Alectoris rufa*) apósacçoes de ropovoamento. *Revista de CiênciasAgrarias*,20, 63-76.
5. Cox, D. and Oakes, D. (1984) *Analysis of Survival Data*, Chapman & Hall, London. 201 pp.
6. Crawley, M. (2013). *The R Book*. Second Edition, Wiley & Sons, UK. 1051 pp.
7. Csermely, D., Mainardi, D., Spano, S. (1984) Escape-reaction of captive young red-legged partridges (*Alectoris rufa*) reared with or without visual contact with man. *Applied Animal Ethology*, 11, 177-182.
8. Duarte, J., Farfán, M., Vargas, J. (2010) New data on mortality, home range, and dispersal of red-legged partridges (*Alectoris rufa*) released in a mountain range. *European Journal of Wildlife Research*. doi: 10.1007/s10344-010-0467-9.
9. Duarte, J., Vargas, J. (2004) Field interbreeding of released farm-reared red-legged partridges (*Alectoris rufa*) with wild ones. *Game and Wildlife Science*, 21, 55-61.
10. Kaplan L., Meier, P. (1958) Non-parametric estimation from incomplete observations. *Journal of the American Statistical Association*, **53**, 457–481.
11. Krebs, C. J. (1999). *Ecological Methodology*, 2nd ed. Addison-Wesley Educational Publishers, Inc. 620 pp.
12. Leif, A. P. (1994)Survival and reproduction of wildand pen-rear ed ring-necked pheasanthens. *Journal of Wildlife Management*, 58, 501-506.
13. Nadal, J. (1992) Problemática de la spoblaciones de perdizroja, bases ecoetològic asparaten ezèxito con la s repoblaciones. *La perdizroja. Gestiòn del habitat*. Fundatiòn la Caixa, Ed. Aedos, Barcelona, pp. 87-100.
14. Paganin, M., Meneguz, P. (1992) Gut length of wild and reared rock partridges (*Alectoris graeca*): its role in release success. *GibierFauneSauvage*, 9, 709-715.
15. PetriniR.,Porrini, S., Papeschi, S. (1995) Differences in survival of wild translocated an dhand-reared pheasants (*Phasianus colchicus*) released in the wild. *Quails and Pheasants*. Proceedings of the 7th International Symposium on Partridges (eds.M.G. Birkan, L.M. Smith, N.J. Aebischer, F.J. Purroy & P.A. Robertson), pp. 23-24. *Game and Wildlife Science*, 2, Office National de la Chasse, Paris.
16. Pinder, J., Wiener, J. & Smith, M. H. (1978) The Weibull distribution: a new method of summarizing survivorship data. *Ecology*, 59,175–179.
17. Pollock, K., Winterstein, S., Bunck, C., Curtis, P. (1989) Survival analysis in telemetry studies: the staggered entry design. *Journal of Wildlife Management*, 53, 7–15.
18. Putaala, A., Hissa, R. (1995) Effects of hand-rearing on physiology and anatomy in the grey partridge. *Wildlife Biology*, 1, 27-31.
19. R Core Team (2014) R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL:http://www.R-project.org/.
20. Robertson, P.A. (1989) The effects of releasing hand reared birds on the British pheasant population. *Pheasants in Asia* (eds. D.A. Hill, P.J. Garson & D. Jenkins), pp. 233-236. World Pheasant Association, Reading, U.K.
21. Sage, R., Putaala, A., Pradell-Ruiz, V., Greenall, L., Woodburn, M., Draycott, R. (2003) Incubation success of released hand-reared pheasants *Phasianus colchicus* compared with wild ones. *Wildlife Biology*, 9, 179-184.
22. Sage, R.,Robertson, P., Wise, D. (2001) Survival and breeding success of two pheasant (*Phasianus colchicus*) strains released into the wild. *Quails and Pheasants*. Proceedings of the 7th International Symposium on Partridges (eds.M.G. Birkan, L.M. Smith, N.J. Aebischer, F.J. Purroy & P.A. Robertson), pp. 331-340. *Game and Wildlife Science*, 18, Office National de la Chasse, Paris.
23. Skalski, J., Ryding, K. &Millspaugh, J. (2005) *Wildlife Demography: Analysis of Sex, Age, and Count Data*. Elsevier Science, San Diego, California. 656 pp.

24. Therneau, T. and Grambsch, P. (2000) *Modeling SurvivalData: Extending the Cox Model*. Springer, New York. ISBN 0-387-98784-3. 350 pp.
25. Therneau, T. (2014) *A Package for Survival Analysis in S.* R package version 2.37-7, URL: http://CRAN.R-project.org/package=survival.
26. Venturato E., Petrini, R., Scarselli, D., Cavallini, P. (2001) Fat ladies and lean girls: morphology influences survival and reproduction of released pen-reared pheasants (*Phasianus colchicus*). Proceedings of the 9th International Symposium on Partridges, Lemesos, Cyprus. pp. 213-214.
27. Withey, J.C., Bloxton, T.D., Marzluff, J.M. (2001) Effects of tagging and location error in wildlife radiotelemetry studies. *Radio tracking and animal populations* (eds. J. Marzluff and J. Millspaugh), pp. 45-75. Academic Press, San Diego, California, USA.

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