

THE EFFECT HAND-REARED.PHEASANTS ON THE WILD POPULATION IN HUNGARY: A MODELLING APPROACH

Csányi, S.

University of Agricultural Sciences, Department of Wildlife Biology and Management, H-2103
Gödöllő, Hungary; email:css@alcess.vvt.gau.hu

KEY-WORDS: effect, hand-reared pheasant, wild population, modelling approach.

ABSTRACT

CSÁNYI, S.: THE EFFECT OF HAND-REARED PHEASANT ON THE WILD POPULATION IN HUNGARY: A MODELLING APPROACH. Hand-rearing ring-necked pheasant (*Phasianus colchicus*) and their releases are traditional methods of game management to increase pheasant bags. During the last decades the number of released pheasants ranged between 1 and 2 million birds per year in Hungary meanwhile the pheasant bag and the wild population showed marked decline. To understand the relationship between the wild population (breeding stock), the number of released birds and their hunting recovery, a simple model was developed. Based on the available management data (spring population size, number of released birds, and harvest) and results of different research programs (reproduction, recovery rates etc.) the trends of pheasant management were analysed. The simulation results indicated that hunters regularly overestimate 1) the reproductive performance of the wild populations and/or the 2) potential recovery of released birds. Consequently, the wild populations had been seriously over harvested for years, which might contribute to the decline of free-living populations. In order to change the poor status of pheasant in Hungary game managers need better data on population dynamics, recovery of released birds, and should change the methods of releasing pheasants.

1.INTRODUCTION

Since the 1970s ring-necked pheasant (*Phasianus colchicus*) is the most important small game species in Hungary. Pheasant stocks reported in each spring increased until the mideighties paralleled by a huge increase of the number of released birds. Although the number of released birds was continuously increasing, the pheasant populazion has been declining since 1978 and the bag reached its peak in 1977. The decrease of the spring population and the harvest occured in spite of the continuous increase of the releases, which reached their peak (>1.7 million birds) in the late 1980 (Figure 1).

Although, authorities realized the problems of the decrease of spring populations and the harvests (TÓTH ET AL., 1983) appropriate actions to change this situation had not been done. Research and proposals were limited to the necessity of improvement of hand-rearing and release methods (NAGY, 1985; NAGY, 1990).

Marking of released birds is the basis to get reliable data on their recovery rate and return of investments. Without this information the efficiency of releases cannot be evaluated, because either the *harvest/released bird ratio* (Figure 2) or the *harvest/spring population ratio* (Figure 3) confuses the contribution of hand-reared and wild pheasants to the harvest (CSÁNYI, 1994).

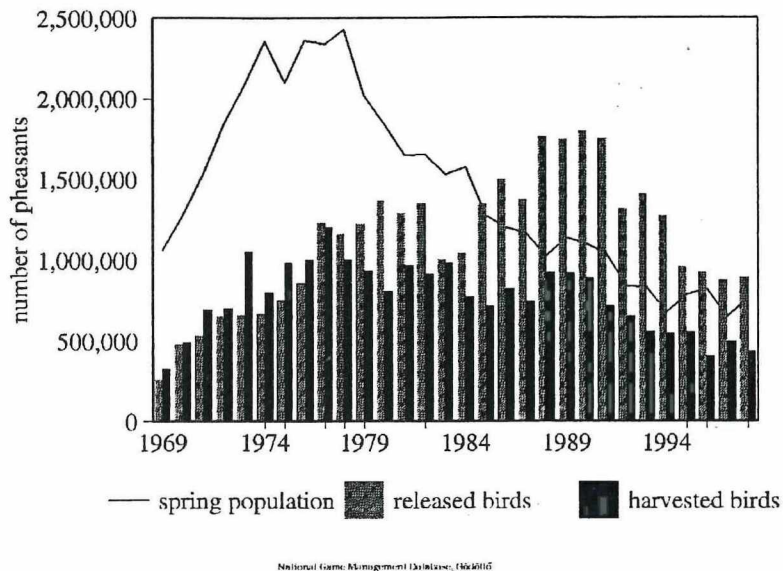
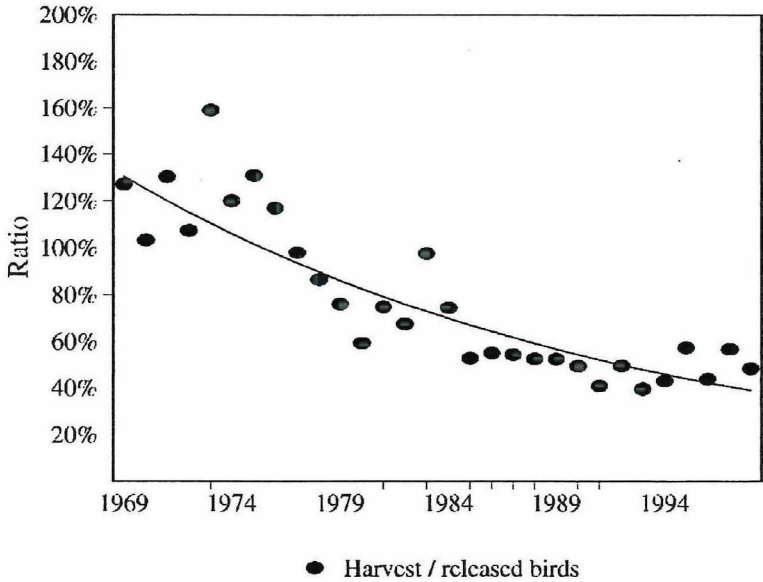


Figure 1: Pheasant population size, releases and harvest in Hungary

Several studies indicated that the survival and the reproductive value of the hand-reared birds are much lower to those of wild birds (ROBERTSON *ET AL.*, 1993; ROBERTSON, 1997) and the effects of hand-rearing on the wild stocks are complex and far-reaching in economic and ecological terms (HILL AND ROBERTSON, 1986; HILL AND ROBERTSON, 1987; HILL AND ROBERTSON, 1988b; ROBERTSON, 1990; ROBERTSON AND HILL, 1992). Except for sporadic cases (FARKAS *CIT.* CSÁNYI, 1987) the appropriate recovery and population data are not available for pheasant populations in Hungary.

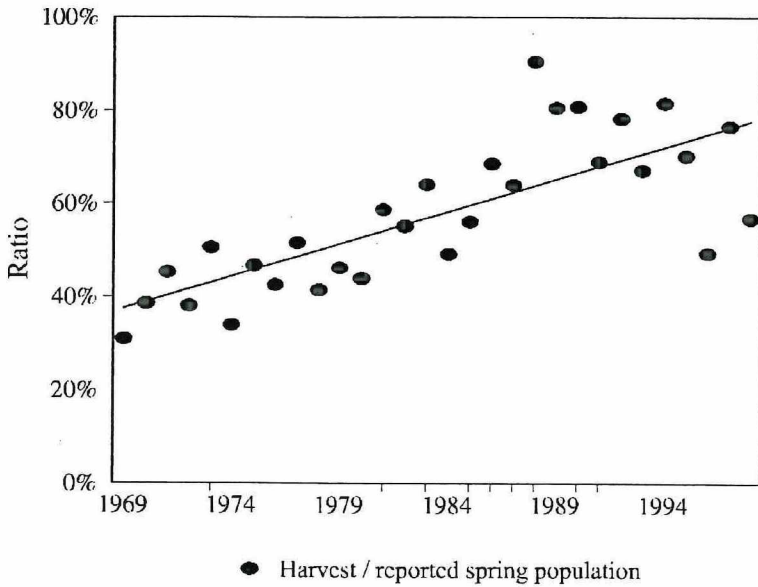
In the lack of the necessary data modelling can be a useful tool to understand the population dynamics and to identify key processes. In order to evaluate the potential effects

of releasing hand-reared birds on the pheasant populations I developed a simple spreadsheet model to describe the population dynamics of pheasant stocks. This model could be modified to incorporate the release of hand-reared birds and also for planning the results of this model and to propose solutions to reduce the effects of hand-reared pheasants on the wild populations.



National Game Management Database (GMD016)

Figure 2: Trend of the harvest/released birds ratio



National Game Management Database, GSKK107

Figure 3: Trend of the harvest/spring population ratio

1.1. THE MODEL AND THE ASSUMPTIONS

Pheasant population dynamics and the harvestable amount

In order to assess the dynamics of the free-living pheasant population I developed a spreadsheet model describing the population changes from year t to $t+1$. The expected population size for males is given by Eq. (1) and for females by Eq. (2):

$$M_{t+1} = [M_t \times (1 - m_{ms}) + 0.5 \times F_t \times (1 - m_{fs}) \times R] \times (1 - m_{mw})$$

Equation (1): M_t = number of males in the spring population, year= t ; M_{t+1} = number of males in the spring population, year= $t+1$; F_t = number of females in the spring population, year= t ; m_{ms} = spring-summer male mortality; m_{fs} = spring-summer female mortality; R = recruitment per female; m_{mw} = fall-winter male mortality

$$F_{t+1}=[F_t \times (1-m_{fs}) + 0.5 \times F_t \times (1-m_{fs}) \times R] \times (1-m_{fw})$$

Equation (2): F_t =number of females in the spring population, year= t ; F_{t+1} =number of females in the spring population, year= $t+1$; m_{fs} =spring-summer female mortality; R =recruitment per female; m_{fw} =fall-winter male mortality

Assuming that harvesting of the free living (wild) birds takes only the annual surplus of the population (*i.e.* the spring population remains stable from one year to the other) the equations can be rearranged and solved for males (Eq.3) and females (Eq.4) as follow:

$$H_{\sigma}=[M_t \times (1-m_{ms}) + 0.5 \times F_t \times (1-m_{fs}) \times R] \times (1-m_{mw})-M_t$$

Equation (3): Calculated harvest for males

$$H_{\varphi}=[F_t \times (1-m_{fs}) + 0.5 \times F_t \times (1-m_{fs}) \times R] \times (1-m_{fw})-F_t$$

Equation (4): Calculated harvest for females.

In the model the hand-reared birds released were treated separately. Their contribution to the harvest was calculated as follows (Eq. 5):

$$H_r=K \times m$$

Equation (5): H_r =the expected recovery of released birds; m =recovery rate; K =number of released birds.

The total planned harvest is the sum of the above amounts (Eq. 6),

$$H_t=H_{\sigma} + H_{\varphi} + H_r$$

Equation (6): H_t =total harvest.

Which should be reduced by the loss resulting from wounding (Eq. 7)

$$H_i=H_t \times (1-c)$$

Equation (7): c =rate of wounding.

Assessing the effect on the free-living population

To assess the potential effect of hand-reared birds on the wild pheasant population, one needs data on their recovery and also on their contribution to the total pheasant harvest. Having data on the recovery rate (m) we can estimate the share of released birds in the full harvest with Eq. 8:

$$HK = \frac{K \times m}{H_t} \times 100 [\%]$$

Equation (8): H_k =Proportion of released birds in the total harvest.

It is also possible to calculate the hunting pressure on the wild population (EQ. 9):

$$H_{sp} = \frac{H_t - K \times m}{M_t + F_t} \times 100 [\%]$$

Equation (9): H_{sp} =hunting pressure on the wild population.

The spreadsheet model and the data

On the basis of the above equations I developed a deterministic spreadsheet model in Corel Quattro Pro 8. The model can be basically used for two purposes: 1) *sensitivity analysis* to evaluate the effect of one or more parameters on a population, and 2) *simulations* to analyse *what if... questions* or various scenarios.

In the modelling presented here I used the pheasant management data (spring population, number of released birds, and harvest) available in the game management statistics (CSÁNYI, 1996; CSÁNYI, 1999) for 1969-1998.

Table 1: Values for the population parameters used in the model presented

Sex-ratio of the spring stock	1 male : 4 females
Non-hunting losses for both males and males	
spring-summer	30%
fall-winter	30%
Recovery rate of released pheasants	25%
Recruitment rate (reared young per female)	
weak	1 young/female
medium	2 young/female
good	3 young/female
Wounding loss	30%

The population parameters were collected from the Hungarian and international literature with a preference for data originating from situation comparable with Hungary (e.g. FESTETICS, 1938; C.T.G.R.E.F., 1972; NAGY, 1984; ANDERSON *ET AL.*, 1985; BEKLOVA AND PIKULA, 1986; HILL AND ROBERTSON, 1986; HILL AND ROBERTSON, 1988A; HILL AND ROBERTSON, 1988B; ROBERTSON, 1990; MAYOT, 1991; LEIF, 1994; CSÁNYI, 1995; ROBERTSON, 1997; RILEY *ET AL.*, 1998). The parameters used in the simulations presented here are shown in **Table 1**.

2.RESULTS AND DISCUSION

The results of the model show that the pheasant stocks were harvested always above the level of the harvestable amount allowed by the 2 young per female recruitment rate (**Figure 4**). Since 1984 the actual bag had even been closer to the harvestable numbers given for 3 chicks per females recruitment. According to FARKAS (CIT. CSÁNYI, 1987) 3 chickens per female are typical for good habitats and/or good seasons in Hungarian pheasant populations. It is interesting to note that the potential harvests (especially at higher recruitment rates) are very much determined by the spring population sizes and the number of released birds has less influence on the lines of potential harvest (**Figure 1** and **Figure 4**). This pattern of the potential and the actual harvest of pheasants indicate a strong opportunity for continued overuse of the wild pheasant populations.

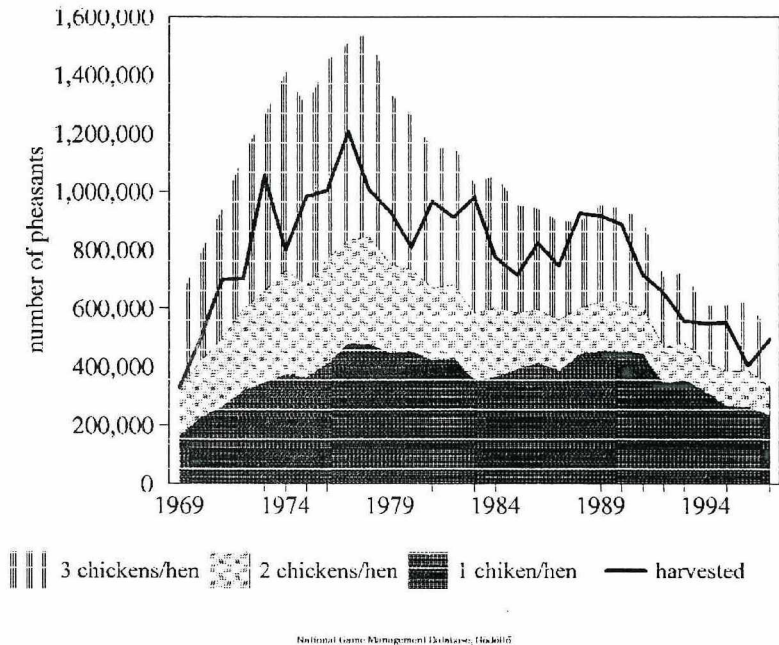
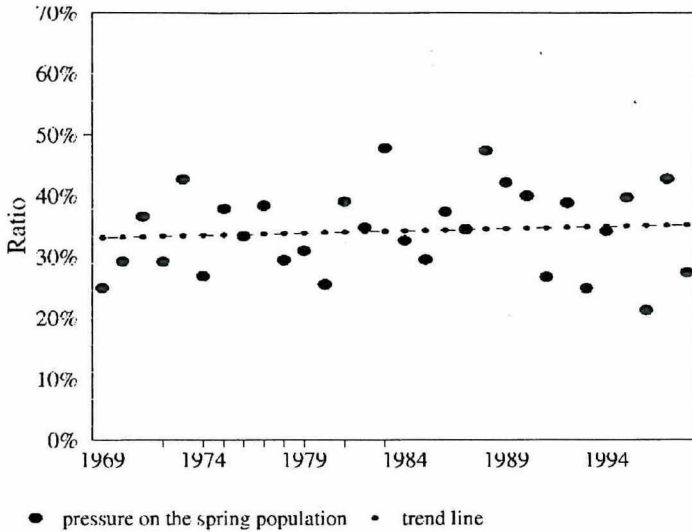


Figure 4: The annual harvest and the potential harvest calculated with 3 recruitment rates

This tendency seems also to be indicated by the rising trend of the hunting pressure on the spring population as calculated with Eq. 9 (**Figure 5**). Although the points are rather scattered, in the light substantial decrease of the spring population, this pattern supports that the wild pheasant stock might be overused decades.

Parallel with the decrease of the spring population the share of the released birds in the bag showed a twofold increase during the 30-year period investigated (**Figure 6**). This pattern is in agreement with other studies (e.g. HILL AND ROBERTSON, 1988b; ROBERTSON AND HILL, 1992), which confirmed that as a consequence of the declining productivity of the wild pheasant population the harvest becomes release-dependent.



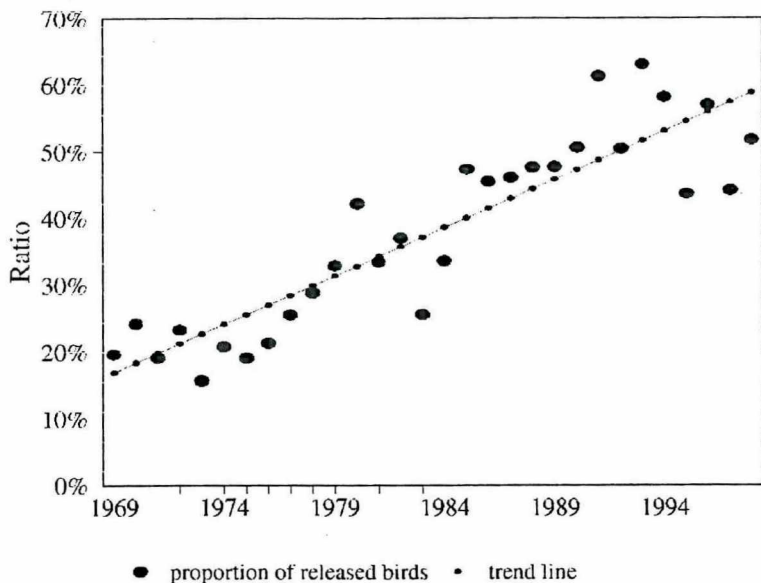
National Game Management Database, 1969-1994

Figure 5: Trend of hunting pressure on the spring (wild) population

As the recovery of the released birds is unknown there is a high risk to seriously over-exploit the wild pheasant populations. Furthermore, the return of investments is expected and this can also contribute to the over-exploitation of the wild populations. Under the Hungarian system this was increased by shooting pheasant hens and the lack of appropriate information on the status of wild populations. The data presented here is a typical case of this scenario resulting in population crash.

The findings presented here underline that the wise management of game populations needs the knowledge of basic parameters influencing population dynamics. For an adaptive management of pheasant populations managers need to collect adequate data on the 1) recovery rates of released hand-reared birds, the 2) recruitment rate of the population, and 3) reliable monitoring of population trends.

The release of hand-reared birds has disadvantageous effects on the free-living populations, which can be reduced if the rearing and release methods are changed, especially mass releases are avoided. Negative effects can be reduced if hen shooting is forbidden or if only males are released. An additional benefit of the males-only release is that the costs can be reduced by all of those related to the rearing of females.



National Game Management Database, 1603010

Figure 6: Trend of the proportion of hand-reared birds in the harvest

In this paper neither habitat management nor the potential role predators and the importance of predator control in small game management have been addressed. Hand-rearing is one element of pheasant management, which should be treated together with the questions of habitat and predator control.

REFERENCES

- ANDERSSON, G.; GÖRANSSON, G. and VON SCHWARTZ, T. (1985): Recruitment and survival in free ranging pheasants. *Acta Reg. Soc. Sci. Litt. Gothoburgensis Zoologica*, **14**: 48-52.
- BEKLOVA, M. and PIKULA, J. (1986): Age composition, mortality and reproduction in Czechoslovakian populations of *Phasianus colchicus* and *Perdix perdix*. *Folia Zool. Brno*, **35**: 127-142.

- C.T.G.R.E.F. (1972): Etude de la dispersion de faisans d'élevage marques dans un secteur du Gatinais. *Rev. For. Fr.*, 347-353.
- CSÁNYI, S. (1987): Vadállományok dinamikája és hasznosítása. Jegyzet vadgazdálkodási szakmérnökök részére. GATE Állattani és Vadbiológiai Intézet, Gödöllő, 152pp.
- CSÁNYI, S. (1994): Fácánállományunk hasznosításának értékelése. Page 24 in: *III. Magyar Ökológus Kongresszus. Előadások és poszterek összefoglalói*, Szeged, július 3-6.
- CSÁNYI, S. (1995): „Ökológiai alapfogalmak vadbiológiai példákkal.” Pages 211-244, 253-254 in: Köhalmly, T. (Ed.) *Vadászati enciklopédia*. Mezőgazda Kiadó, Budapest
- CSÁNYI, S. (Ed.1996): *Vadgazdálkodási Adattár 1960-1995*. Gödöllői Agrártudományi Egyetem, Gödöllő, 230pp.
- CSÁNYI, S. (Ed.1999): *Vadgazdálkodási Adattár 1994-1998*. Országos Vadgazdálkodási Adattár, GATE vadbiológiai és Vadgazdálkodási Tanszék, Gödöllő, 80pp.
- FESTETICS, P. (1938): *A fácán és a fogoly tenyésztése, óvása és vadászata*. Hubertus vadászkiadó. Pátria Irodalmi Vállalat és Nyomdai Rt., Budapest, 152pp.
- HILL, D. and ROBERTSON, P. (1986): Hand-reared pheasants: how do they compare with wild birds? *Game Conservancy Annual Review-1985*, **17**: 76-84.
- HILL, D. and ROBERTSON, P. (1987): Hand-reared pheasants: hoe they affect productivity? *Game Conservancy Annual Review-1986*, **18**: 65-69.
- HILL, D. and ROBERTSON, P. (1988a): Breeding success of wild and hand-reared ring-necked pheasants. *Journal of Wildlife Management*, **52**: 446-450.
- HILL, D. A. and ROBERTSON, P. A. (1988b): The pheasant: ecology, management and conservation. Collins, London, 300pp.

- LEIF, A. P. (1994): Survival and reproduction of wild and pen-reared ring-necked pheasant hens. *Journal of Wildlife Management*, **58**: 501-506.
- MAYOT, P. (1991): Le faisán. Brochures techniques de l'Office National de la Chasse. *Office National de la Chasse*, Paris, 32pp.
- NAGY, E. (1984): A fácán és vadászata. Mezőgazdasági Kiadó, Budaöpest, 250pp.
- NAGY, E. (1985): „Az intenzív szárnyasvadtenyésztés biológiai és technológiai rendszere” Doktori értekezés tézisei, MTA Tudományos Minősítő Bizottság, Budapest.
- NAGY, E. (1990): Szárnyasvadtenyésztés vadgazdálkodási szakmérnök hallgatók részére. GATE Állattani és Vadbiológiai Intézet, Gödöllő, 254pp.
- RILEY, T. Z.; CLARK, W. R.; EWING, D. E. and VOHS, P. A. (1998): Survival of ring-necked pheasant chicks during brood rearing. *Journal of Wildlife Management*, **62**: 36-44.
- ROBERTSON, P. (1990): Hand-reared pheasants and partridges: how are the wild stocks? *Game Conservancy Annual Review.*, **21**: 96-97.
- ROBERTSON, P. (1997): A natural history of pheasant. *Swan Hill Press*, Shrewsbury, 160pp.
- ROBERTSON, P. and HILL, D. (1992): „A bird in the bush is worth four in the hand-hand-rearing and the productivity of pheasants.” Pages 305-309 in: BOBEK, B.; Perzanowski, K. and Regelin, W. (Eds): *Global trends in wildlife management-Trans. 18th IUGB Congress, Krakow 1987*. 2. Swiat Press, Krakow-Warsawa.
- ROBERTSON, P. A.; WISE, D. R. and BLAKE, K. A. (1993): Flying ability of different pheasant strains. *Journal of Wildlife Management*, **57**: 778-782.
- TÓTH, S.; BENÉNÉ IGNÁCZ, M.; BÜKI, L.; EGYED, I.; MÁTRAI, G.; NAGY, E.; SINKOVITS, M.; SZTOJKOV, V.; VARGA, I. and ZAJÁK, Á. (1983): Fácántenyésztés 1973-1983. Kézirat, MÉM Vadászati Főosztály, Budapest.