

## THE LAJTA PROJECT - THE PILOT PROJECT OF THE HUNGARIAN PARTRIDGE CONSERVATION PROGRAM (HPCP)

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### ABSTRACT

FARAGÓ, S.: THE LAJTA PROJECT - THE PILOT PROJECT OF THE HUNGARIAN PARTRIDGE CONSERVATION PROGRAM (HPCP): The author reports on his long-term investigations referring to the grey partridge population (1989-1997) and its environment (1992-1997) covered by the LAJTA Project in the area of the Lajta-Hanság Joint Stock Company in Western Hungary (47°51' N and 17°12' E). The Project extending over approximately 3100 ha represents the pilot project of the Hungarian Partridge Conservation Program.

In the first part of the report, ecological conditions determining the existence and dynamics of the species are outlined.

Having reviewed the basic ecological background, author present essential methods of habitat development (chemical-free field margins, unmowed grassland and alfalfa margins, weedy strip between crops, partridge field strip, cereal field margins harvested later, harowed strips, fallows, chemical-free fields) and their parameters, reviewing various data referring to changes in ecotone density. Total length of linear microhabitats characteristic for the LAJTA Project amounted to 105.9-108.6 m/ha in the period 1992-1994 and to 106.8-114.6 m/ha in the years 1995-1997.

Results of predator control representing the other essential element of game management testify the necessity of regulating the population numbers of fox, magpie and hooded crow. Feral dogs and cats should be prevented from entering the area dealt with.

In the initial phase of investigations (1989-1991) with traditional game management, density of the Partridge population did not reach 2 ind./km<sup>2</sup>. After introduction of habitat management, population size and density increased, -at first abruptly (1992: 173 birds=5.61 ind./km<sup>2</sup>), later on continuously but in a decelerating rate until 1995 (311 birds=10.08 ind./km<sup>2</sup>). Afterwards we observed drastic regression in population size: spring number of birds dropped to 44, i.e. 1.43 ind./km<sup>2</sup>. In August, population size amounted merely to 158 individuals (5.12 ind./km<sup>2</sup>). The latter value experienced permanent increase until 1992. In that year 842 birds were registered. (27,28 ind./km<sup>2</sup>). The year 1993 proved to be less successful: in late summer 435 birds were counted. (14.10 ind./km<sup>2</sup>). However, in August 1994 population size amounted to 1184 individuals, i.e. 38.38 ind./km<sup>2</sup>.

Due to wet summer weather in 1995, merely 386 birds were counted, thus population density was as low as 12.51 ind./km<sup>2</sup>. As a result of the latter severely unsuccessful year, break-down of population size ensued in 1996. (Spring numbers: 82=2.66 ind./km<sup>2</sup>). In 1996 reproduction period was found to be of similarly low efficiency, verified also by low population size amounting only to 124 individuals and by August population density of 4.02 ind./km<sup>2</sup>. Consequently, breeding populations suffered further decrements. However, reproduction period being more successful in 1997, size of breeding population increased to 201 individuals and density to 6.52 ind./km<sup>2</sup>.

Fertility of partridge population (CSR) was found to be highly variable, ranging from 27% to 77%, proportionately to egg and chick losses. Adult birds suffered increased losses, however, from winter losses no tendency could be deducted.

Key factor analysis indicated that mortality factors leading to most severe deficits were losses of eggs and chicks ( $k_1$ ) as  $k_1$  provided the greatest slope from a regression against  $K$  ( $b=0.617$ ). It is unquestionable that

as compared to egg and chick losses ( $k_1$ ) summer losses of adult individuals ( $k_2$ ) regression coefficient: ( $b=0.301$ ) and winter losses ( $k_3$ ) ( $b=0.083$ ) were of lesser significance.

Between average mean temperature of the reproduction period and the number of reared chicks definite positive relatedness existed ( $b=1.68$ ) with medium correlation ( $r=0.57$ ) i.e. if average mean temperature increased, also numbers of successfully reared chicks experienced increments. The same correspondence can be stated in respect of mean temperature in June and numbers of reared chicks, although the latter relationship was found to be somewhat weaker ( $b=1.35$ ,  $r=0.47$ ).

Spring and summer mortality of adult birds ( $k_2$ ) was lowest in 1991 (0.042), from that time on suffering gradual increments until 1996 (0.032), thus the degree of exacerbation proved to be 7,5 fold (!). Change of such extent can be attributed exclusively to growth of fox population.

Age structure of population present in August manifests close connection with CSR values and with the size of breeding population. Proportion of young birds ranged from 60% to 88%.

Causes for regression in the partridge population that had formerly manifested great results, are summarized by the author as follows:

- Due to privatisation, in approximately one half of the area covered by the Project, system of farming on small holdings was developed. Consequently, fallows practically ceased to exist, disturbances reached a high degree but technological intensity of cultivation (mechanization) did not experience considerable decrements.
- Habitat development of emphasized intensity was continued, however, exclusively in the area covered by the competence of the Lajta-Hanság Joint Stock Company, i.e. limited to one half of the area included in the Project.
- Up to now, it has been impossible to carry on negotiations with the new landowners in respect of habitat management, -partly because of their great resoluteness manifested in regard-of farming, partly due to small sizes of holdings and also to lack of up-to-date attitude.
- Resulting from immunization against rabies, fox population has experienced powerful increments in spite of intensive thinning.
- Winter period 1995-1996 was long and cold, with crusty deep snow cover; during the reproduction period of the year 1996 weather conditions proved to be extremely disadvantageous, and also the winter season 1996-1997 was cold and long-lasting.

The author of the present report approves further practical enforcement of the principle of "wise use" in the Project. This being the only way for the rehabilitation of partridge population. Long-term monitoring can reveal basic relationship and also demonstrate effects and results of activities carried out in the scope of game management.

## 1. INTRODUCTION

Grey partridge populations of Hungary have suffered severe reduction in course of the latest 25 years. At the time of perceiving the onset of this process, as only way of solution stock compensation by means of hand-rearing was pointed out. This solution having proved unsuccessful, in 1978 shooting ban was introduced for partridge. The latter measure is still valid and has led to rapid lessening of interest manifested by hunters for this species.

Problems having become more and more numerous, Hungarian Partridge was included in the Red Book in its own home country (RAKONCZAY, 1989). Neither competent authorities, nor investigators made sufficient efforts to reveal the above problems and find ways for their solution. Consequently, in the early 1990s in Hungary, no recent study was available in which the causes of stock reduction were analysed and alternative solutions

offered. Intolerability of the above situation and necessity of searching for solutions was formulated in a study (FARAGÓ, 1986), delineating the possible ways for improvement and also the "gene centres" in which the necessary investigations could be started. However, the latter publication did not succeed in attaining significant changes in attitude. Such fundamental changes were made possible only by changes in the political system of Hungary in 1990, allowing new conceptions to be evolved freely. In this way the HUNGARIAN PARTRIDGE CONSERVATION PROGRAM (HPCP) was established, assisted by the DEPARTMENT OF GAME MANAGEMENT AND FISHERY OF THE MINISTRY OF AGRICULTURE and fitted into the conceptions of the latter. Projects of the HPCP are in "gene centres" defined earlier. The LAJTA Project serves as the pilot project of the Program. The Project comprises a long-term monitoring on habitats located in agricultural areas and on small game populations living in these sites. An important aim of the Project is to investigate grey partridge considered as indicator species.

## 2. THE AREA OF THE PROJECT

The area covered by the Project at the time of its establishment is identical with the Mosonszolnok district of the LAJTA-HANSÁG JOINT STOCK COMPANY extending over 3100 ha. The landscape was characterized by intensive large-scale cultivation and predominance of arableland. After 1994 nearly one half of the area was privatized.

Arborescent vegetation in present primarily in the form of forest belts with widths of 15-25 m, length of each belt amounting approximately to 1 km., and their total area covering roughly 110 ha. The structure of the Project area experienced nearly no alterations during the initial period of our investigations. After privatisation of holdings smaller fields became establishment.

Referring to climatic conditions of the study area conclusions can be drawn on the basis of data supplied by the Meteorological Station of the town Mosonmagyaróvár:

Mean annual temperature	9.6C°
Annual amount of precipitation	504 mm
Relative atmospheric humidity	73%
Days with rough weater (min≤-10C°)	13 days
Days with winterly weather (max.=0C°)	29 days
Frosty days (min=0C°)	95 days
Days with summerly weather (max≥25C°)	62 days
Heat days (max≥30C°)	12 days

In respect of hydrology, the area of the Project is fairly poor, possessing no watercourses.

As in the Project, conditions of plant cultivation for the purposes of fodder production predominated, those years were considered as advantageous in course of which the ratio of perennial plants, of those sown in autumn and of fallows reached or exceeded 60% (1994 and 1997) as well as those in which autumn harvesting of root crops was performed gradually (1993, 1994, 1995), furthermore years with protracted reclamation of stubbles (1993, 1994) and those in course of which winter cereals were sown at an early date (1993, 1994, 1995). In the area covered by the LAJTA Project structure of sowing was found to have been more advantageous for partridge in the first 3 years than in the last 3-year period.

Positive effects are to be observed primarily owing to the fact in course of privatisation, large fields were divided into smaller ones.

The Project area is rich in small game, their population numbers amounting to the following: pheasant: 450, brown hare: 600, roe deer: 190 individuals.

### **3. MATERIAL AND METHODS**

#### **3.1. Number of the populations**

For examining the populations of bird and mammal species living in the Project area, we apply the mapping method based on continuous complex population assessment. The gamekeeper employed in the territory covered by the Project spends annually about 250 days in this area, carrying out assessments with the help of 6-8 students of our Faculty. These assessments are carried on for approximately 30 days. In this way it is possible to keep registers referring to each partridge family from the time of pair formation and home range occupation to the winter period. In course of on-site recording, results are fixed on data sheets and maps. In course of performing counts the method of POTTS (1986) was applied.

On the basis of population sizes determined in the breeding period and in August, causes of mortality responsible for population dynamics, and also the significance the aforementioned causes were determined by the key factor analysis (POTTS, 1986; CHLEWSKI AND PANEK, 1988)).

Simultaneously with permanent investigations on game birds populations, total avifauna of the Project area is also being examined continuously, with special regard to forest belt. These investigations have supplied data referring also to densities of breeding

populations of avian predators in the period 1989-1997, as well as the result of monthly counts performed in 1996 and 1997 referring to birds of prey.

In the breeding period of partridge, marsh harrier (*Circus aeruginosus*) and buzzard (*Buteo buteo*), whereas in the winter season buzzard and hen harrier (*Circus cyaneus*) may threaten young birds reared by partridges. However, in the LAJTA Project the role of marsh harriers as predators is insignificant.

Assessment of burrows of badgers and foxes (1996 and 1997) indicated that densities of badgers (*Meles meles*) are low (max. 0,13 family/km<sup>2</sup>) whereas fox (*Vulpes vulpes*) population consists mainly of large numbers of immigrants that soon become killed. Owing to the effectiveness of the Immunization Program against rabies, mortality of *Vulpes vulpes* has been considerably reduced in Western Hungary, and bag sizes increased approximately to the double.

### 3.2. Methods of the habitat improvement

The structure of sown area described above being not definitely advantageous for partridges, it has to be altered if our efforts are aimed at increasing the game carrying capacity of the respective area and thereby the density of the partridge population breeding there. Beneficial changes are to be achieved by increasing the length of field margins and by enhancing the extensivity of farming carried out in such areas.

In course of habitat improvement we applied the following methods:

- Chemical-free field margins
- Chemical-free fields
- Weedy strips between two crops
- Fallows
- Unmowed margins of grassland and alfalfa fields
- Cereal field margins mowed at later dates
- Partridge fields

We were able to realize further advantageous alterations by introducing ban for mowing in forest belts possessing no zone of brushwood. Since the introduction of this measure, egg mortality has experienced decrements.

#### 4. RESULTS

Due to our activities total leight of the ecotons characteristic for the LAJTA Project amounted to 105,9 - 108,6 m/ha in the period 1992-1994 and to 106,8 - 114,6 m/ha in the years 1995-1997.

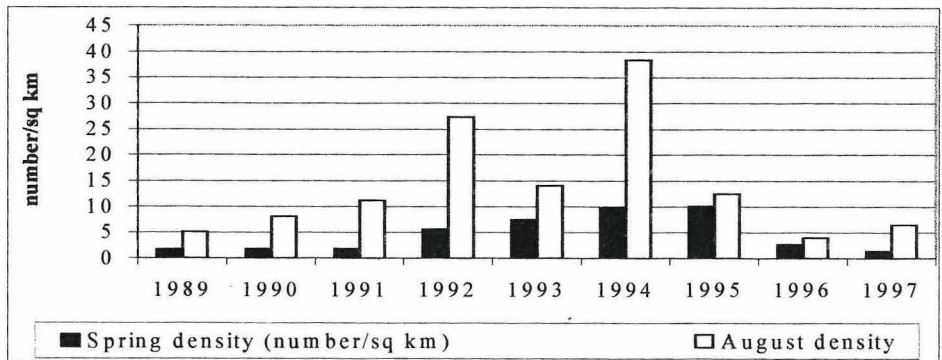
Results of predator control representing the other essential element of game management testify the necessity of regulating the population numbers of fox, magpie and hooded crow. Meanwhile they demand that feral dogs and feral cats should be prevented from entering the area dealt with.

In course of the period covered by our investigations, a welcome tendency of regression was observed in the ratio of feral animals present in bags (1992: 70%→1995: 35%). Meanwhile some increments ensued in the ratio of fox (1992: 24%→1997: 46%) and hooded crow (1992: 6%→1997: 14%), demanding enhanced observation and regulation referring to the populations of these species. But the breeding population sizes of hooded crow (*Corvus corone cornix*) and magpies (*Pica pica*) have dropped to very low levels owing to intensive predator control performed by shooting and selective poisoning (3-chloro-4-methylaniline hydrochloride). As hooded crows continuously arrive from the floodlands of the Danube and from Austria, it is desirable to maintain the present level of control. Performing the latter task is one of most important duties of the gamekeeper employed in the Project, and it will bear the same importance in the future too.

In course of analysing partridge population the following were examined: population size and density, fertility and mortality, sex- and age conditions.

In the initial phase of investigations (1989-1991) with traditional game management, density did not reach 2 individual/km<sup>2</sup>. After introduction of habitat management, population size and density increased, - at first abruptly (1992: 173 birds=5,61 birds/km<sup>2</sup>), later on continuously but in a decelerating rate until 1995 (311 birds=10,08 birds/km<sup>2</sup>). Afterwards we observed drastic regression in population size: spring number of birds dropped to 44, i.e. 1,43 birds/km<sup>2</sup>.

In August, population size amounted merely to 158 individuals (5,12 birds/km<sup>2</sup>). The latter value experienced permanent increase until 1992. In that year 842 birds were registered. (27,28 birds/km<sup>2</sup>). The year 1993 proved to be less successful: in late summer 435 birds were counted. (14,10 birds/km<sup>2</sup>). However, in August 1994 population size amounted to 1184 individuals, i.e. 38,38 birds/km<sup>2</sup> (**Figure 1.**).



**Figure 1:** Density of partridge population in the LAJTA Project, 1989-1997

Due to wet summer weather in 1995, merely 386 birds were counted, thus population density was as low as  $12.51 \text{ birds/km}^2$ . As a result of the latter severely unsuccessful year, break-down of population size ensued in 1996. (Spring numbers:  $82=2.66 \text{ birds/km}^2$ ). In 1996 reproduction period was found to be of similarly low efficiency, verified also by low population size amounting only to 124 individuals and by August population density of  $4.02 \text{ birds/km}^2$ . Consequently, breeding populations suffered further decrements. However, reproduction period being more successful in 1997, size of August population increased to 201 individuals and density to  $60.52 \text{ birds/km}^2$ .

Fertility of partridge population (CSR) was found to be highly variable, ranging from 27% to 77%, proportionately to egg and chick losses. Adult birds suffered increased losses, however, from winter losses hno tendency could be deducted.

Age structure of population present in August manifests close connection with CSR values and with the size of breeding population. Proportion of young birds ranged from 60% to 88% (**Table 1.**).

By key factor analysis could be defined, which type of mortality occurring in various phenological periods exerts influence on population dynamics and which of the types mentioned afore has to be regarded as determinant.

Key factor analysis indicated (**Table 2 and Figure 2.**) that mortality factors leading to most severe deficits were losses of eggs and chicks ( $k_1$ ) as  $k_1$  provided the greatest slope from a regression against K ( $b=0.617$ ). It is unquestionable that as compared to egg and chick losses ( $k_1$ ) summer losses of adult individuals ( $k_2$ ) regression coefficient: ( $b=0.301$ ) and winter losses ( $k_3$ ) ( $b=0.083$ ) were of lesser significance.

**Table 1:** Parameters of the partridge population in the LAJTA Project, 1989-1997.

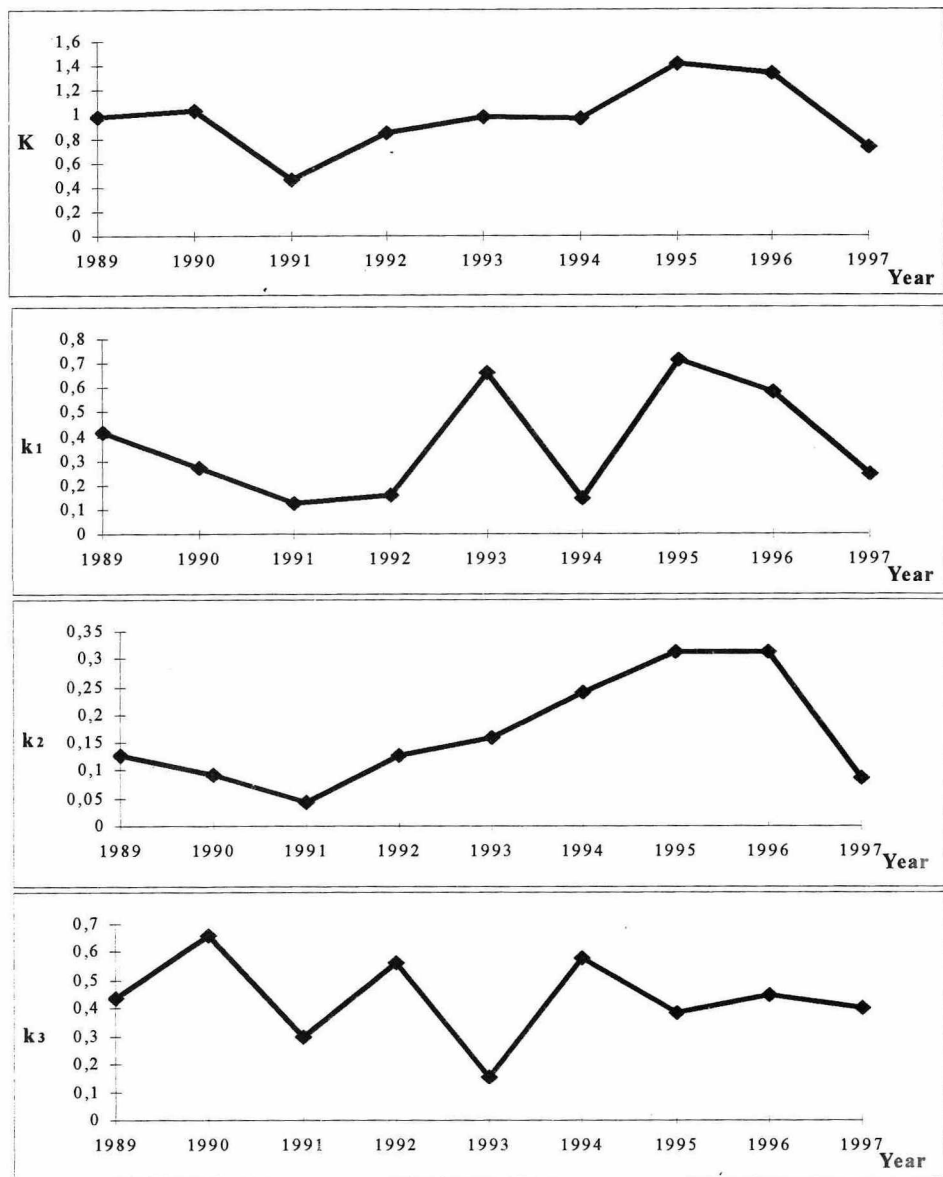
Parameters	1989	1990	1991	1992	1993	1994	1995	1996	1997
Birds observed in spring	52	58	54	173	231	306	311	82	44
Spring density (number/sq km)	1,69	1,88	1,75	5,61	7,49	9,92	10,08	2,66	1,43
Number of males	26	29	27	93	125	161	168	45	22
Number of females	26	29	27	80	106	145	143	37	22
Sex ratio (male:female)	1,00	1,00	1,00	1,16	1,18	1,11	1,17	1,22	1,00
Successful pairs	26	29	27	67	84	112	39	13	15
% successful adults	100	100	100	77	73	73	25	32	68
Successful adults	52	58	54	134	168	224	78	26	30
Total birds in August	158	248	344	842	435	1184	386	124	201
Adult birds in August	39	47	49	129	159	176	152	40	36
Young birds in August	119	201	295	713	276	1008	234	84	165
Young:adult ratio	3,05	4,28	6,02	5,53	1,74	5,73	1,54	2,10	4,58
Chick survival rate (CSR%)	22,9	42,1	77,4	76,4	15,76	56,6	29,7	30,7	75
August density	5,12	8,04	11,15	27,29	14,1	38,38	12,51	4,02	6,52
Winter losses		63,3%	78,2%	49,7%	72,5%	29,6%	73,7%	78,8%	64,5%

Between average mean temperature of the reproduction period and the number of reared chicks definite positive relatedness existed ( $b=1,68$ ) with medium correlation ( $r=0,57$ ). I.e. if average mean temperature increased, also numbers of successfully reared chicks experienced increments. The same correspondence can be stated in respect of mean temperature in June and numbers of reared chicks, although the latter relationship was found to be somewhat weaker ( $b=1,35$ ,  $r=0,47$ ).

Spring and summer mortality of adult birds ( $k_2$ ) was lowest in 1991 (0.042), from that time on suffering gradual increments until 1996 (0.032), thus the degree of exacerbation proved to be 7,5 fold (!). Change of such extent can be attributed exclusively to growth of fox population.

**Table 2:** Changes in k-values in the LAJTA Project , 1989-1997

Év	K	k1	k2	k3
1989	0,98	0,419	0,126	0,435
1990	1,026	0,272	0,092	0,662
1991	0,463	0,123	0,042	0,298
1992	0,85	0,16	0,128	0,562
1993	0,977	0,662	0,16	0,155
1994	0,967	0,145	0,241	0,581
1995	1,409	0,715	0,311	0,383
1996	1,342	0,581	0,312	0,449
1997	0,731	0,242	0,088	0,401



**Figure 2:** Graphical key factor analysis for partridge population in LAJTA Project, 1989-1997.

## 5. DISCUSSION

The conception that egg mortality i.e. clutch losses can play an extremely important role among the causes leading to low density of partridge populations was contained by our original hypothesis as well, on the basis of which we started habitat improvement. By investigations carried out since that time, the correctness of our hypothesis and the efficacy of management performed in the Project area have been confirmed. Investigations have also supported opinion stated earlier according to which conservation of *Perdix perdix* can be realized only in exactly defined areas, periods of time and under exactly defined conditions.

Causes for regression ensuing in course of the years 1995-1997 in the partridge population that had formerly manifested great results, are summarized as follows:

- Due to privatisation, in approximately one half of the area covered by the Project, system of farming on small holdings was developed. Consequently, fallows practically ceased to exist, disturbances reached a high degree but technological intensity of cultivation (mechanization) did not experience considerable decrements.
- Habitat improvement of emphasized intensity was continued, however, exclusively in the area covered by the competence of the LAJTA-HANSÁG JOINT STOCK COMPANY, i.e. limited to one half of the area included in the Project. Up to now, it has been impossible to carry on negotiations with the new landowners in respect of habitat management, -partly because of their great resoluteness manifested in regard of farming, partly due to small sizes of holdings and also to lack of up-to-date attitude.
- Resulting from immunization against rabies, fox population has experiences powerful increments in spite of intensive thinning.
- During the rproduction period of the year 1995 weather conditions proved to be extremely disadvantageous. Winter period 1995-1996 was long and cold, with crusty deep snow cower. In the reproduction period of 1996 weather conditions proved to be extremely disadvantageous repeatedly, and also the winter season 1996-1997 was cold and long-lasting.

It is advisable to perform further enforcement of the principle of "wise use" in the Project, this being the only way for the rehabilitation of partridge population. Long-term monitoring can reveal basic relationship and also demonstrate effects and results of activities carried out in the scope of game management.

We can adopt methods that have proved to be successful elsewhere, but their introduction will be effective only if factors influencing population dynamics locally are revealed, and introduced methods are aimed at eliminating or decreasing negative factors.

In the practice of Hungarian small game management there used to be some endeavours that tried to simplify problems in extreme manner and solve them confined only on certain - sometimes second-rate - factors, or considered handrearing and releasing as the only possible solution.

Consequences of these errors are testified by statistical data and also by undetected wasting of millions of forints. Purely economic interests also require enhanced predomination of ecological attitude as the availability of financial sources is limited in hunting ranges as well.

Only fulfillment of the above-mentioned requirements will allow us to shoot partridges in Hungary again, after so many years, - however, in the spirit of wise use.

THE HUNGARIAN PARTRIDGE CONSERVATION PROGRAM whose pilot project is the LAJTA Project is primarily aimed at the objectives presented in my report.

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