PRELIMINARY RESULTS OF REPRODUCTIVE PARAMETERS OF THE BROWN HARE ON FIELD TERRITORIES

ISTVÁN MAJZINGER[1]

[1]***University of Szeged, Faculty of Agriculture, Hungary***

Abstract: *The knowledge and monitoring of main parameters of the brown hare population are fundamental to the reasonable game management. From the point of quantitative regu-lation the age structure, the sex ratio and reproductive parameters are essential.The pre-sent examination is a part of a long term inquiry and these results are preliminary. We collected and statistically evaluated data from two field hunting territories. Set out from the Kovács-Heltay model (Kovács – Heltay, 1993) threshold values were established.*

The juvenile-adult ratio on the two territories is 0,65 and 0,32; the fertility rate of the fertile females was 0,58 and 0,61. The average yearly progeny 7,39 and 9,32; regarding for the fertility rate the average progeny are 4,28 and 5,68. For the stabilize the population the threshold of juvenile-adult ratio is r=0,79. On the examined territories in appropriate time this parameter was more lower so that the applied harvest was necessarily at the expense of breeding stock.

Keywords*: brown hare, population structure, fertility, placental scars, recruitment rate (juvenile adult ratio).*

INTRODUCTION

A brown hare is an r-strategist species; therefore the mortality of offspring is high. From the point of reasonable management, the harvest must be altered according to the yearly changes of the population size (2). These findings are the preliminary results of our long-term study. The main breeding season of brown hare is between February and October (9, 4). The gestation takes 40-41 day, but in certain cases the interval between the successive litters is 38 days (superfetation). Other found 84% fertility in case of adult females and 1% in juvenile ones (1). Hungarian studies revealed 2% participation of juvenile individuals in reproduction (9). Other showed that the 64,9% of adult females and 37,5% of juveniles reproduced (7). The ratio of sterile females is up to 35-40% and the inflammation of oviduct is the most frequent cause it (9). During a year there are 4-5 reproductive cycles, which mean 8-9 offspring, but only 2-3 of them become adult because of the high mortality (10). Other found that the average litter size per female was 5,0 -7,5 (5), on the other hand 72 fetus per pregnant female based on data from 57 hare (8). Placenta attaches very strongly to uterus wall, so the detachment of placenta results scars on it, which remain visible for longer period. One placenta scar means one fetus within the reproductive cycle. The age-and sex-ratio of the population and the progeny are essential for the reliable management. Before the autumn and winter harvest, we need to know the annual progeny. The adult and juvenile hares are distinguished based on the Stroh-mark. The Stroh-mark is epiphyseal knob located about 1cm from the joint in the distal end of juvenile hares' ulna. It can be felt by touch in 7 months old leverets, but it disappeared in

case of 8-9 months old (11, 12), or 7-8 months old hares (3). The age ratio can be precisely determined by measuring the dry mass of eye lens.

MATERIALS AND METHODS

The study was conducted in two field hunting territories in Southern Hungary (Csongrád County). These sites are mostly characterized by agricultural areas. The data about sex, age and progeny was obtained from hunted hares in first site in 2010 (38 specimens), and in 2011 in the other site (41 specimens). The determination of sex was performed in hand by inspection of the external genitals. We used Stroh-mark for the age assessment. The reproductive organs of females were used to determine the fertility and progeny. That female was considered fertile which had at least one placental scar. The number of placental scars is equal with the number of leveret born in that breeding season. Data were analyzed by Microsoft Excel and SPSS Statistics 17.00.

RESEARCH RESULTS

Age structure and fertility of the autumn population: The age structure in the hunting bag was 15 juvenile and 23 adult hare (N=38) in the first site. The juvenile-adult ratio form Kovács-Heltay (1993) model was r=0, 65 in the autumn population. In the other site in 2011 the age structure was 10 juvenile and 31 adult hare (N=41), and the juvenile-adult ratio r=0, 32 (*Figure 1A).* In the first site in 2010 the fertility ratio was 0,58 for the 38 studied female, and it was 0,40 in case of juveniles, and 0,69 in adults. In the other site in 2011, the fertility ratio of all the studied female was 0,61, and 0,50 in case of juveniles and 0,64 in adults (*Figure 1B).*

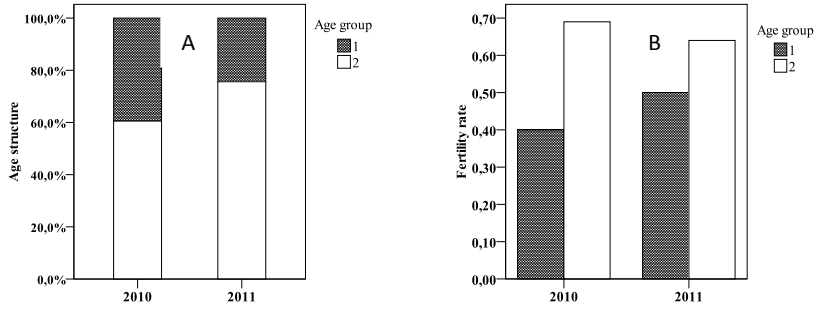

Figure 1. Age structure of the autumn population (A) and fertility of females (B)

(Age group: 1 – juvenile, 2 – adult)

Reproduction, reproductive performance: The reproductive performance (number of offspring) of fertile females (in 2010 N=22; in 201 N=25) is equal with the placental scars in the uterus (*Table 1).*

Table 1

The number of offspring calculated on the fertile females only

Number of offspring (fertile only)						
Year	**Age group***	**N**	**Mean**		**Std. deviation**	**CV%**
2010	1	6	6,33	7,39	2,58	40,95
	2	16	7,75		3,00	38,71
2011	1	5	5,80	9,32	1,64	28,27
	2	20	10,20		3,56	34,90

*: 1 – juvenile; 2 – adult

In 2010, the mean number of placental scars of juvenile hare was 6,33 (N=6), and 7,75 in adults (N=16). Both sample was homogeneous and the difference between the means was not significant (p=0,320). In 2011, the mean of placental scars' number in juveniles (N=5) was 5,80 and 10,20 in adults (N=20) and the difference between them was significant (p=0,014) (homogeneous variance, 95% confidence interval, P=0, 95) (*Table 1*).

There was no significant difference (p=0,700) between the number of the juveniles' placental scars in 2010 (6,33; N=6) and in 2011 (5,80; N=5). In case of adults, the difference was significant (p=0,035) (95% confidence interval, P=0,95) between the means in 2010 (7,75; N=16) and in 2011 (10,20; N=20). (*Figure 2A).* The repoductive performance of all females was calculated by using the mean progeny and fertility ratio of fertile females (*Table 2*).

Table 2

The reproductive performance calculated on all the females

Reproductive performance								
Year	**Age group***	**N**	**Fertility rate**		**Mean offspring/fertile**		**Mean offspring/all females**	
2010	1	15	0,40	0,58	6,33	7,39	2,52	4,28
	2	23	0,69		7,75		5,43	
2011	1	10	0,50	0,61	5,80	9,32	2,90	5,68
	2	31	0,64		10,20		6,58	

*: 1 – juvenile; 2 – adult

There was significant difference (p=0,043; P=0, 95) between progeny of all juvenile and adult females in 2010 (juvenile: mean: 2,52; N=15; adult: mean: 5,43; N=23). In 2011 the mean progeny of juvenile was 2,90 (N=10) and the adult' mean progeny was 6,58 (N=31) and the difference between them was significant (p=0,610; 95% confidence interval, P=0,90). The mean progeny of all juvenile hare did not differ significantly (p=0,797) between 2010 (2,52) and 2011 (2,90). We got the same result in case of adults (p=0,410) (mean progeny in 2010: 5,43; in 2011: 6, 58) (*Figure 2B).*

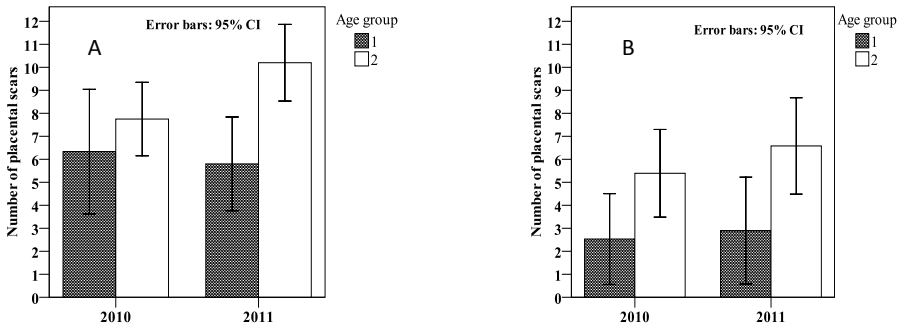

Figure 2. Mean placental scars in fertile females (A) and in all the females (B)

(Age group: 1 – juvenile, 2 – adult)

Table 3

The results of t-test for equality of means (p-values)

		Fertile ♀		All ♀	
		2010 - 2*	**2011 - 1***	**2010 - 2**	**2011 - 1**
Fertile ♀	**2010 - 1**	0,320	0,700	-	-
	2011 - 2	**0,035**	**0,014**	-	-
All ♀	**2010 - 1**	-	-	**0,043**	0,797
	2011 - 2	-	-	0,410	**0,061**

*: 1 – juvenile; 2 – adult

CONCLUSIONS

The juvenile-adult ratio was unfavorable (r=0,65 and r=0,32) and we found significant difference between the age groups (*Figure 1A).* There was found 0,19-0,74 juvenile-adult ratio based on Stroh-mark in three study sites in 2000 and 2001, however it was 0,28-1,44 based on dry mass of eye lens (2). The mean fertility ratio of the two age groups, which is essential for management planning, was almost the same 0,58 and 0,61 in our two study sites (*Figure 1B).* According to these results, the 39-42% of females did not reproduce. This ratio was 35-40 % in the studies of KOVÁCS AND HELTAY (9) and MÖLLER (13). The difference between the age groups was significant and highlights the importance of the adults in the population total reproductive performance (*Table 2.).*

The mean annual progeny of juvenile and adult females was 7,39 in the first site and 9,32 in the other site. It is important to highlight the different contribution of age groups to total reproduction of the population. According to a study on the plain in Northwestern Hungary, the mean placental scar of the juvenile female was 2,4 and 4,6 of the adult females (7). The mean raised progeny per female was 1,4-3,0. In Sweden the mean annual progeny per female was 6,8- 8,9 between 1974-1976 (6). The mean annual progeny per female was 4,28, and 5,68 in the two study sites based on the fertility ratio and the mean progeny per female *(Table 2).* The mean progeny of juvenile females was 2,52 and 2,90 in the two sites, which is statistically the same (p=0,797; *Table 3).* The mean progeny of adult females was 5,43 and 6,58 and also not differed significantly (p=0,410, *Table 3).* However, the reproductive performance of the age groups differed significantly. In the first site the mean progeny of juveniles was 2,52 and 5,43 for the adults (p=0,043), in the other site the same values were 2,90 and 6,58 (p=0,061) (*Table 3).*

In both sites, our results revealed that the harvest exceeded the amount that the population can compensate, based on the high ratio of non-reproducing females, the unfavorable juvenile-adult ratio and the high mortality of progeny.

REFERENCES

1. BENSINGER, S. KUGELSCHAFTER, K. ESKENS, U. SOBIRAJ, A. (2000): Untersuchungen zur jarlichen reproductionsleistung von weiblichen Feldhasen (*Lepus europaeus*) in Deutschland. Z. Jagdwiss., Volume 46.

2. BÍRÓ, ZS. SZEMETHY, L. (2002): A Kovács-Heltay féle mezei nyúl gazdálkodási modell kritikája és továbbfejlesztésének lehetősége. Vadbiológia. Volume 9.

3. BROEKHUIZEN, S. MAASKAMP, F. (1979): Age determination int he European hare (Lepus europeaus Pallas) in the Netherlads. Z. Säugetierkunde. Volume 44.

4. FARAGÓ, S. (2002): Vadászati állattan. Mezőgazda Kiadó, Budapest. pp. 250-259.

5. FARKAS, D. (1983): Eltérő egyedsűrűségű mezei nyúl állományok reprodukciós képességének vizsgálata. Beszámoló jelentés a Természet és Vadvédelmi Állomás 1983. évi munkájáról. Fácánkert.

6. FRYLESTAM, B. (1980): Reproduction in the European hare in southern Sweden. Holarctic. Ecol. Copenhagen. Volume 3.

7. GÁL, J. (2006): A Lajta-Hanság mezei nyúl állományának vizsgálata különös tekintettel annak egészségügyi helyzetére. PhD értekezés. Sopron.

8. HELTAY, I. SZÉKY, P. (1975): Populáció-dinamikai vizsgálatok mezei nyúlnál. A vadgazdálkodás fejlesztése. Volume 7.

9. KOVÁCS, GY. HELTAY, I. (1993): A mezei nyúl. Ökológia, gazdálkodás, vadászat. Mezőgazdasági Kiadó, Budapest.

10. KOVÁCS, GY. (1986): A szaporodási ciklus befejező szakasza a mezei nyúlnál: mikor kezdődjön a vadászidény? Vadbiológia. Volume 1.

11. KŐHALMY, T. (edit.) (1994): Vadászati enciklopédia. Mezőgazda Kiadó, Bp.

12. KŐHALMY, T. (1999): Korbecslések. Szarvastól a siketfajdig. Nimród Vadászakadémia. Volume 2.

13. MÖLLER, D. (1980): Der Verlauf der Fortpflanzungsaktivität beim Feldhasen (Lepus europaeus Pallas, 1778) im Jahresablauf. Beitr. Jagd- und Wildfrosch. Volume 11.