

Invited paper

**AGE DETERMINATION OF BROWN HARE IN PROVINCE OF VOJVODINA
FOR SEASON 2016, TRENDS OF JUVENILE IN POPULATION**

Beuković M.¹, Popović Z.², Beuković D.¹

Abstract: The age structure of the brown hare population during the harvesting season is an indicator of the population growth potential and important feedback in sustainable management of brown hare. The rational harvesting of the hare's population is one of the most important protection procedures and it should be well monitored and controlled by the hunting user. Samples of brown hare (one eye) were collected and analyzed during season 2016. from hunting grounds in province Vojvodina. Lens processing were followed the procedure of: preparation, drying, and the measurement. After individual weighing, lenses were classified by the weight. In these research, we chose two age classes: young (juvenile) brown hares class, survived from previous cycle to beginning of hunting season, and older (adult) brown hares class, which participated in previous reproductive period. All the hunting grounds in province Vojvodina are merge in three regional authorities Srem, Banat and Bačka. In Srem region based to 1367. collected samples from 11 hunting ground users, percent of juvenile was 46.88%. Banat region results shows 41.60% of juvenile brown hares based on 1115 samples. The huge sample size was in Bačka region, 1727 brown hares, with 44.10% juvenile brow hares in population. Evaluation of this results could be classified in group (41-50%) - "weak". Unfavorable situation for percent of juvenile in population of brown hare is in accordance with the present trend in the last 5 years. Causes were the subject of many researches and usually related to of abiotic factors, especially climatic and biotic factors especially anthropogenic.

Keywords: brown hare, percent of juvenile, Vojvodina, game management

Introduction

Lepus europaeus is widespread and abundant across its geographic range (Flux and Angermann 1990). In can be found in various habitats but it is the best adapted to lowland regions (Jennings, 2006; Beuković et al., 2007; Pintur et al 2006) where there are best conditions for its development and reproduction. There is evidence that population significantly declines within the last two decades of the 20th century in Central Europe (Strauss and Pohlmeier 2001; Kamieniarz and Panek 2008). Smith et al. (2005) point out that decrease of brown hare population size since 1960s is in association with the intensification of agricultural practices. In research Kamieniarz et al (2013), they partially confirms the findings of recent synthesis concerning hare–habitat relations carried out by Smith et al. (2005). The importance of heavy hunting pressure on the population dynamics

¹ Beuković Miloš, PhD, professor; Beuković Dejan, PhD, assistant professor, University of Novi Sad, Faculty of Agriculture, Novi Sad, Serbia;

² Popović Zoran, PhD, professor; University of Belgrade, Faculty of Agriculture, Zemun, Serbia
Corresponding author: Miloš Beuković, email: milos.beukovic@stocarstvo.edu.rs

of brown hares, was assessed on a cereal and sugar beet large-scale farming area for over 3 years, by using spring census and hunting bag analyses (Pepin, 1987).

Research by Naumov, (1948) determined the close dependence between the number and age. Age distribution is largely a result of the performance of reproduction and survival of the previous period, but is, also, cause the performance of reproduction in the next reproduction cycle (Šelmić 1997).

In terms of management of brown hare, very important measures are focused to keeping sustainable of population numbers. Therefore, it is very important harvesting plan control, which must be adjusted according to the autumn age structure of brown hare.

Material and Methods

In the order to investigate the management of the hare population in the Vojvodina region on a total area of 1,985,626 hectares, in the harvesting season 2016, the data was processed for 4,209 eye lenses from hunting grounds in Vojvodina province. The method of determining the age of hares based on the dry weight of eye lenses (Lord, 1959; Rieck 1962). In determining the age of hares based on the dry weight of eye lenses, it has been taken, the limit value of 280 mg (Šelmić; Šelmić, and Jovanović, 1980; Suchentrunk et al., 1991). In this analyze we used two age classes, one which includes the hares up to 1 year old where the mass of eye lenses is up to 280 mg and the other which includes individuals older than 1 year where the mass of eye lenses is over 280 mg. (Šelmić, 1977; Slamečka et al. 1997; Pintur et al. 2006).

Table 1. Evaluation scale Status of population brown hare of based to autumn percent of juvenile (Šelmić, and Jovanović, 1980)

Status of population brown hare	Autumn Percent of juvenile
Very weak	Up to 40%
Weak	from 41% - 50%
Good	from 51% - 57%
Very good	from 58% - 63%
Great	over 64%

Based on results of percent of juvenile in autumn age structure of brown hare, were evaluate according to evaluation scale (Table 1.)

The statistical analysis of results was performed by the software package "Statistica 13" (StatSoft, Inc. 2011), and this method was used - LSD test variable was calculated for determining the percent of leverets probabilities for post hoc tests.

Results and Discussion

The results of age structure of brown hare in Vojvodina (Table 2., Chart 1.) show that the average percentage of the juveniles was lowest in Banat 41,60%, based on 1115 samples (Chart 2.). Table 2. also shows results 44.10% , it was average percentage of the juveniles on Bačka territory (Chart 1.) based to 1727 samples of brown hare (Chart 2.),

while the lowest average percentage of the juveniles recorded in Banat, 46.80 %, (Table 2., Chart 1, 2), based to 1367 samples of brown hare (Chart 1, 2). Based to evaluation scale of population brown hare of autumn percent of juvenile (Table 1), it can be seen that status in Srem and Bačka is "Low", while in Srem is just above border between "Very low" and "Low". Beuković et al (2013) in period 200-2009. found in territory of Bačka variation percent of young 51.26-65,41%. So year 2000 (53.24%) and 2003. (51.26%) are marked as the years with the lowest percent of young in the hare population versus year 2005 (65.41%) and 2004 (62.41%) (Beuković et al. 2013).

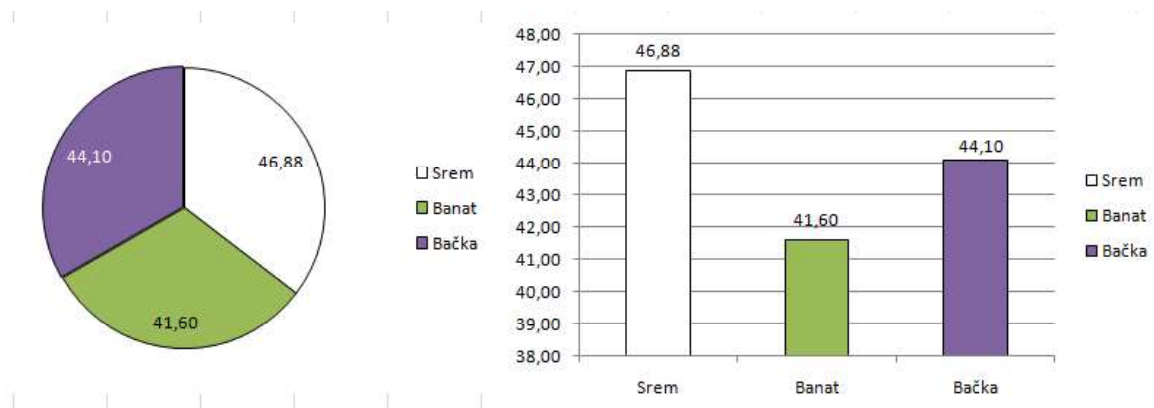


Chart 1. Percent of juvenile brown hares in Vojvodina at 2016. season

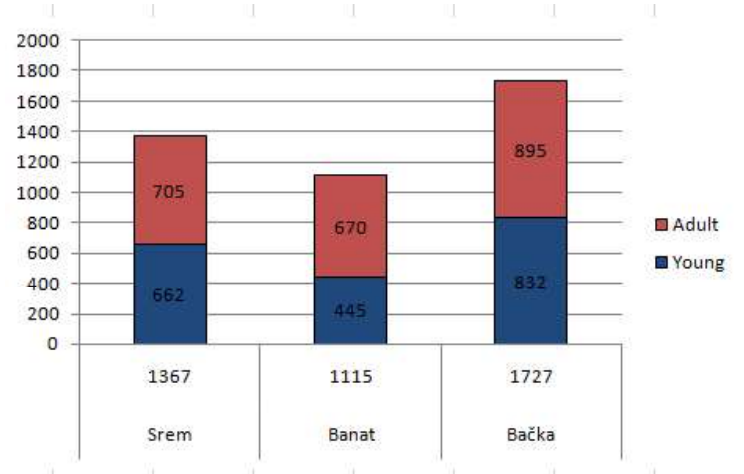


Chart 2 Number samples juvenile and adult in Vojvodina at 2016. season

On the territory of Backa in the valley of the river Tisa (9 hunting grounds) for period 2002-2007 Beuković et al (2009), found 51 % percent of juvenile in 2003 year (lowest), 65% percent of juvenile in (2005. year (highest). It is evident that in over the years for both studies, the average percent of juvenile had better results then results this research for season 2016.

In research from Croatia, a total of 383 European hares were sampled from three separate hunting grounds within the Međimurje region from 2004 to 2006; was very heterogene 31-61% of juvenile in age structure (Popović 2008).

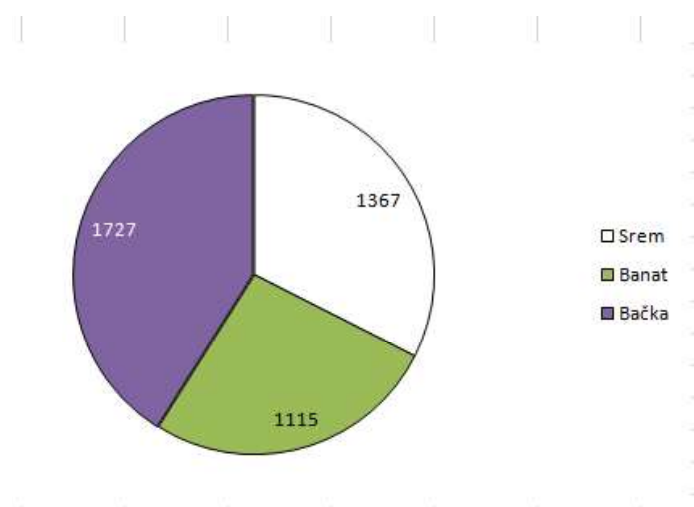


Chart 3. Number of analyzed samples of brown hare in Vojvodina at 2016. season

Table 2 Percent of juvenile brown hares in Vojvodina at 2016. season

	Mean	Std.Err.	Least Squares Means		N
			-95.00%	+95.00%	
Srem	46.88 ^{ns}	±4.21	38.42	55.34	10
Banat	41.60 ^{ns}	±3.06	35.46	47.73	19
Bačka	44.10 ^{ns}	±2.72	38.64	49.56	24

^{ns} - no significant difference $p > 0,05$

In this research we didn't find significant statistical difference between percent of juvenile at the territory of Srem, Banat and Bačka (Table 2.), while standard error was highest in Srem ± 4.21 , and lowest in Bačka ± 2.72 .

Table 3 Management recommendations of brown hares in Vojvodina at 2016. season

Territory	Harvesting By plan	Suspension harvesting plan	Harvesting plan correction	No data	Small sample
Srem	17	3	40	18	2
Banat	12	11	23	53	11
Bačka	10	4	38	49	7

The results in the Table 3 show that the territory of Banat recorded the highest number of recommendation for suspension of harvesting plan (11), and highest not submitting samples (no data from 53 location). The highest plan correction has been recorded in

Bačka, 38 locations. The lowest suspension of harvesting plan (3), highest harvesting by plan (17) and harvesting plan correction (40) has been recorded in Srem (Chart 4).

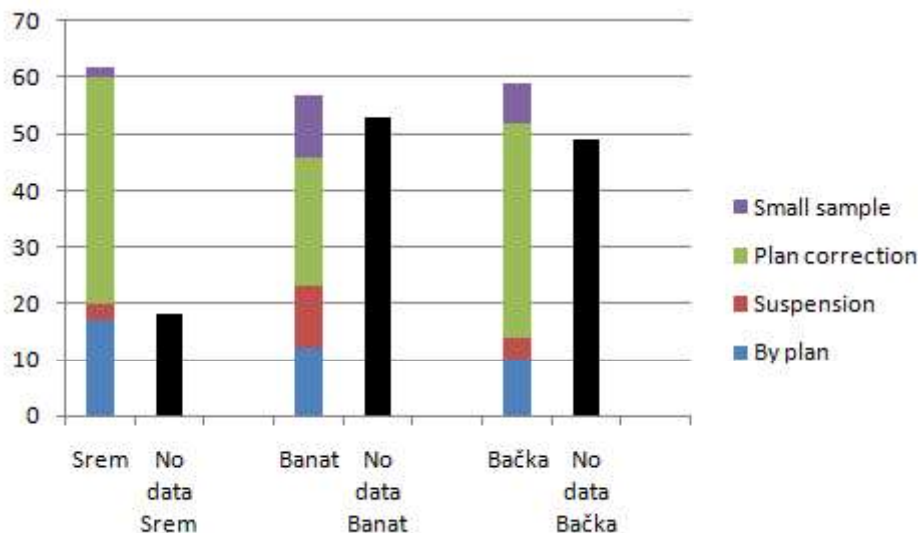


Chart 4 Management recommendations of brown hares in Vojvodina at 2016. season

It is observed also as a phenomenon, “not submitting the samples” (no data in Chart 4), or a small sample submission. Since that the age determination is not mandatory for hunting ground users according by actual regulations, it is suspected that they deliberately avoiding to send samples for analysis. Especially if during observation of field or during hunting detect a small number of brown hares.

Conclusion

Season 2016. for brown hare population in Vojvodina, was a bit weak. In Srem region based to 1367. collected samples from 11 hunting ground users, percent of juvenile was 46.88%. Banat region results shows 41.60% of juvenile brown hares based on 1115 samples. The huge sample size was in Bačka region, 1727 brown hares, with 44.10% juvenile brown hares in population. Evaluation of this results could be classified in group (41-50%) - "weak". In analyse We didn't find significant statistical difference between percent of juvenile at the territory of Srem, Banat and Bačka

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