

DETERMINATION OF REAL GROWTH AND TROPHY STRUCTURE OF DEER GAME IN THE HUNTING GROUNDS OF VOJVODINA

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Summary: Studies of fertility and real gain of deer were carried out in the hunting ground "Novi Becej" for the period from 1994. to 2012. year. Total area of this hunting ground is 28,233 ha, of which 25,210 ha is hunting and hunting - productive for roe deer is 23,856 ha.

Materials and methods

In 1994. by counting it was found that there were 1,317 deer in spring (5.52 animal/100 ha), while in 2012. there were 2,182 animals (9.15 animals/100 ha), what is an increase of 865 animals (65.68% compared to the first year of observation)

Results

In quinquennial periods, determined real gain was: between 1994-1998., 0.79; 1999-2003., 0.68; 2004-2008., 0.72., and from 2009 to 2012. was 0.64. For processed - studied period (1994-2012) average real gain was 0.70 of fawns per roe deer older than 2 years, and it is proposed to be used in the preparation of planning documents (hunting base and management plan) for all hunting areas in Vojvodina. Average gross weight of trophies from the hunting grounds were: Senta - 443.1 g (39 trophies), Novi Becej - 431,56 g (87 trophies), Nova Crnja 442.00 g (22 trophies), while in the 2012. the weight was 438.39 g (36 trophies), and in 2011. 389.80 g (61 trophies) and Novo Milosevo 381.47 g (57 trophies). The average largest volume was in the 2013: Nova Crnja with 151 cm³, Senta with 150 cm³, Novi Becej with 112 cm³ and Novo Milosevo with 105 cm³. Average in CIC points of the hunted bucks in the hunting tourism for 2013. per hunting grounds was: Senta with 98.9 CIC points, Nova Crnja with 91.54 CIC points, Novi Becej with 85.29 CIC points and Novo Milosevo with CIC points, and the average buck age was in Senta 5.7 years in the Novi Becej 6.1 years and 6.9 years in Nova Crnja.

Conclusions

Obtained results show that the hunting of the trophy buck is performed in "the optimal" period of age, between 5 and 7 years of age, that the average gross weight of trophy buck ranges in terms of hunting ground of Vojvodina between 390 and 450 g, with an average volume of horn from 100 to 150 cm³, and the average of the CIC points from 85 to 100.

Keywords: roe deer, real gain, hunting ground, trophy, age

Introduction

By the method of total counting at the beginning of April was determined by numerical strength of deer, gender, age structure and trophy of males based on the rejection of bast (skin) from antlers. Based on the number of seen fawns during the count, committed harvest and recorded losses of fawns over the year, a growth of fawns is established for the previous hunting season. Based on an established number of fawns and the number of adult (breeding) doe that provided increase, the coefficient of growth of fawns was calculated in the past hunting year. Monitoring the size of fawns increment from the time of littering (May), until the hunt (October), observing and searching the area of doe littering and fawn guiding in the spring was done by gamekeepers. Gamekeepers were recorded

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does, from May to July, with precise number of fawns and the exact date when they saw them. Any loss of doe or fawns that occurred during the summer season, were also recorded by gamekeepers. Breeding deer's is regulated by the annual plan of hunting ground, making the dynamics population for does in a specific year. The basis for making management plan for deer is established, by counting in April, the numerical strength - spring fund, gender and age structure, and the structure of male trophies specifically for hunting which was developed by real growth. For hunting grounds in which was made the real growth in addition to the parameters that were obtained in the spring counting, then tracking does that led fawns from May to July, there was a clean record of fawns suffered during the summer months (heavy rain in May and June when the fawns were small, and the littering, as well as by predator attack, in the first place jackals, and foxes). In the hunting season, since 1st of October to 31th of January for each locality in which we explored we have accurate data about harvested fawns (male and female), as well as harvested does.

Under increment means the number of fawns that every year increasing the numerical strength of does in hunting ground. This growth is expressed as a percentage of the number of females over the age of two years, participating in breeding, and breeding stock is determined by counting in early spring (April), after all the losses that have negatively affected in the studied population. Because of this fact is also recommended that counting of does is done in the spring, that is in April, after all the losses, because then we will know with what to dispose in the hunting year, starting with the number fertilized does, the last year number of male and female fawns that remained after the hunt, to determine the age structure of the remaining male species.

In the fall, after removing the crop, we are able to perform the counting and on the basis of number of, we compare the data with the planned increment with which we work the planning documents, and the actual growth rates established before the hunting season (1th of October).

Purpose of the research

The aim of these surveys is to present based on authentic data whether and how much achieved increase before the harvest varies according to the plan that was developed by management plan (as compared to expected), and the three-year follow-up to determine if there are fluctuations in the real increment within population and between the studied about populations.

Achieved-actual growth is very important component of dynamics population, is defined by the time of gender maturation of each individual, proportion of females participating in mating and the average size of the litter-hatch-offspring. The fertilization rate (number of embryos per leading doe), growth (number of fawns soon after littering), losses of fawns in first 5 to 6 months of life and realized / autumn growth before the harvest, are important parameters that must be familiar with management of does populations.

The realized growth rate is very important component of population dynamics, and is determined by the time of gender maturation of each individual, proportion of females involved in mating and the average size of the youngs. The fertilization rate (number of embryos per doe), growth (number of fawns soon after littering - the size and number of fawns), losses of fawns in the first 5 to 6 months of life and realized / autumn growth before the hunting, are important parameters that must be known and respected at management of population.

Studies in many countries of Europe have confirmed the high level of fertilization at doe, examination of embryos (Danilkin, 1996), it was found that in Lithuania only 3.4% of females is not fertilized, in Poland 6.5% to 14% of unfertilized females (Danilkin, 1996), in Denmark this percentage ranged from 0 to 5% of unfertilized females (Strandgaard, 1972), in Romania 14% of unfertilized females (Almasan, 1966). About the size of offspring established immediately after the littering of does in most cases it is a two fawns, then in smaller percentage one fawn, and rarely three fawns. The Romanian study confirmed the relationship, in 78% two fawns, 19,4 % one and in 2,6% three fawns (Almasan, 1966). So far included data about reproduction capabilities of does are correct, but the most important part of the practice with deer management is the number of fawns in relation to the total number of females in the fall (October) before the hunting season, "real growth ". Number of fawns per doe in autumn significantly reduced compared to the number of littered fawns (May-June). From the literature is known the survival rates of fawns from spring to autumn, and are about: Denmark 78%

(Strandgaard, 1972), 68% for England, 53% to Switzerland, in Germany from 57% to 93% for France from 38% to 84% (Gaillard et al. 1998). Mortality of does is extremely high during the first springtime / summer period, and can often be up to 50% (Strandgaard 1972). In Germany the first week of life lost-suffer 10% of fawns (Stubbe, 1997), while in Poland the total mortality from May to November is 37.6% (Danilkin, 1996).

During the research of growth in the Baranja in 1967. and the 1970s. and, (Nikolandić DJ., Degmečić D., 2007) the number of fawns per doe before the harvest at all the study sites was significantly higher than planned increase rate in April. The authors found that the growth in April, for forest area of Baranja (Belišće, Darda and Tikveš) was planned in the amount of 69% of the total number of females. This information proved to be significantly lower compared to all three locations. Planned (expected) growth ranged from 60% to 120% compared to the realized growth before the hunting. The fact that is evident from the results, and confirmed in studies by other authors is that achieved increase can vary considerably in the same area from year to year. This fact is confirmed by locations Belišće and Tikveš that are in 1967. were significantly lower than the actual growth in the remaining years of observation. Both locations were exposed to periodic flooding of the Danube and the Drava river, and at both locations were protected and unprotected part of the flood.

A year earlier in 1966. was recorded a significant and lasting level of Danube and Drava rivers, and considering that the does at that time are littering and are extremely attached to their original habitat, a lot of does suffered in the flood, and the surviving part of the does could not be physiologically prepared for mating that year, because in protected area of habitat from flooding were all kinds of wild games in excessive numbers. Therefore, the realized growth in 1967. was significantly lower than other years. The area of the location Darda did not show significant fluctuation of real growth, because a significant part of forestry is located inside Baranja, where flooding had no effect.

In Vojvodina, based on four year research and five hunting areas (Ristic, 1999), the growth has varied, depending on the hunting reserve and year, from 0.45 to 0.90 fawns per leading doe, or the average for the entire period, and for all the district is 0.63. Average growth in the Czech Republic according to Nečas (1972) goes from 80% to 120%, while in cruel conditions fawns growth is not more than 40% -50%. In the researches by Popovic et al. (2007), the real growth varies depending on the year and the hunting reserve from 0.65 to 1.1 fawns per doe older than 2 years or more. Average real growth for studied period was 0.86 fawns per leading doe.

Material and Methods

Determination of planned growth of fawns, just before the hunting does and fawns were done during the months of September and October. Professional field staff has collected the following information:

1. The total number of observed does on the hunting grounds the Hunting Association Novi Bečej)
2. Of the total number of seen does, how many were:
 - a) without fawns,
 - b) with one fawn,
 - c) with two fawns,
 - d) with three fawns.

Field hunting staff (gamekeeper and explorer) were at the observation of games or other business in hunting area, in the book of observation was immediately recorded each individual of deer, as well as a random sample. Additionally entering by memory, was not considered as valid. The collected data for 2012th year were analyzed using standard statistical methods, and it was based on calculated coefficient of planned growth (real growth).

Results and Discussion

The durability of hunting management by hunting species is achieved by supporting the optimal number, density and natural gender ratio, gender / age structure of the populations studied.

In order to maintain the durability of doe management, it is necessary in each local population continuously monitor and supplement information on the following parameters:

- population size;
- population density;

- gender ratio;
- age of the game;
- fund of gravid females;
- growth was so low. (growth was so low. provided);
- achieved percentage of growth (which is done for each year and for each hunting area for the correction of harvesting plan);
- excrete from the population (harvest and losses).

Table 1. The Outline of size of the hunting ground Novi Bečej

<i>The surface structure</i>	<i>Experimental field (ha)</i>
Total surface	28.233
Hunting surface	25.210
Hunting productive area for deer	23.856
Reservation	7.872
Land in the public sector	17.554 (62%)
Land in the private sector	10.679 (38%)
Non-hunting surface	3.023
Fields	18.563
Orchards and Vineyards	442
Meadows and pastures	4.591
Waters and ponds	547
Forests and forest lands	796
Unproductive land	3.294
Total:	28.233

Table 1 presents the structure of hunting grounds by users, but it is also given the hunting - productive area for all cultivated species in this hunting ground, and even deer.

Table 2. Determining the real growth at does using the method of total counts in the spring throughout the experimental area (March-April)

Year of observation	Deer, numerical strenght	Doe, numerical strenght	Male fawn, numerical strenght	Female fawn, numerical strenght	Total number of fawns	Real growth in spring	Gender ratio
1994.	322	595	179	221	400	0,67	1:1,63
1995.	334	604	211	259	480	0,79	1:1,58
1996.	364	549	170	255	425	0,77	1:1,51
1997.	335	530	246	237	483	0,91	1:1,32
1998.	376	591	215	259	474	0,80	1:1,44
1994-1998.		2.869			2.262	0,79	
1999.	389	704	241	250	491	0,70	1:1,51
2000.	457	684	349	273	622	0,91	1:1,19
2001.	362	668	147	134	281	0,42	1:1,58
2002.	404	754	315	235	550	0,73	1:,1,38
2003.	607	846	266	290	556	0,66	1:1,30
1999-2003.		3.656			2.500	0,68	
2004.	695	961	327	330	657	0,68	1:1,26
2005.	800	1.126	398	408	806	0,72	1:1,28
2006.	729	1.029	414	393	807	0,78	1:1,24
2007.	692	1.029	387	392	779	0,76	1:1,32
2008.	701	1.133	350	404	754	0,67	1:1,46

2004-2008.		5.278			3.803	0,72	
2009.	798	1.350	470	581	1.051	0,78	1:1,52
2010.	922	1.500	466	650	1.116	0,74	1:1,55
2011.	835	1.431	343	484	827	0,58	1:1,63
2012.	615	1.177	228	262	490	0,42	1:1,71
2009-2012.		5.458			3.484	0,64	1:1,71
1994-2012.		17.261			12.049	0,70	

For the observed period since 1994. to 2012. year ratio is determined the average coefficient of real growth of 0.70 fawns per doe over the age of 2 years, with a maximum which was recorded in 1997. of 0.91 fawns per doe and a minimum in year of 2001, and 2012. of only 0.42 fawns per doe. For year 2012. year, which will be recorded as one of the driest years in this area with such low increment has been shown to have had a big impact on the survival of fawns, but not only climate, also increased number of predators influenced the growth was so low.

As for the gender ratio it was between 1:1,19 - 1:1,71 in the benefit of females, or the whole observed period that was 1:1,43, which was satisfying.

Table 3. Calculating the real growth of does after counting (using the method of total counts) in the spring on the whole experimental area (March-April) with the addition of harvested does (which are littered) and harvested fawns for every hunting season

Year of observation	Doe, numerical strenght	Harvested does	Total number of does	Fawns, numerical strenght	Harvested fawns	Total number of fawns	Calculated real growth
1994.	595	32	627	400	21	421	0,67
1995.	604	29	633	480	26	506	0,80
1996.	549	16	565	425	22	447	0,79
1997.	530	17	547	483	23	506	0,93
1998.	591	10	601	474	11	485	0,81
1994-1998.			2.973			2.365	0,80
1999.	704	34	738	491	34	525	0,71
2000.	684	11	695	622	14	636	0,92
2001.	668	14	682	281	42	323	0,47
2002.	754	22	676	550	28	578	0,86
2003.	846	75	921	556	28	584	0,63
1999-2003.			3.712			2.646	0,71
2004.	961	69	1.030	657	13	670	0,65
2005.	1.126	72	1.198	806	24	830	0,69
2006.	1.029	75	1.104	807	49	856	0,78
2007.	1.029	65	1.094	779	7	786	0,72
2008.	1.133	68	1.201	754	37	791	0,66
2004-2008.			5.627			3.933	0,70
2009.	1.350	108	1.458	1.051	17	1.068	0,73
2010.	1.500	101	1.601	1.116	6	1.122	0,70
2011.	1.431	105	1.536	827	4	831	0,54
2012.	1.177	29	1.206	490	15	505	0,42
2009-2012.			5.801			3.526	0,61
1994-2012			18.113			12.470	0,69

If we analyze tab. 3 and calculating the real growth at does after counting (using the method of total counts) in the spring on the whole experimental area (March-April) with the addition of harvested does (which are littered) and harvested fawns for every hunting season for period since 1994. to 2012. year, then can be observed a smaller growth of 0.69 fawns per doe older than 2 years.

Table 4. Determining the gender ratio by age in experimental plots in Novi Bečej

Year of observation	Deer, numerical strenght	Male fawn, numerical strenght	Total number of males in hunting area	Doe, numerical strenght	Female fawn, numerical strenght	Total number of females in hunting area	Gender ratio
1994.	322	179	501	595	221	816	1:1,63
1995.	334	211	545	604	259	863	1:1,58
1996.	364	170	534	549	255	804	1:1,51
1997.	335	246	581	530	237	767	1:1,32
1998.	376	215	591	591	259	850	1:1,44
1994-1998.			2.752	2.869		4.100	1:1,49
1999.	389	241	630	704	250	954	1:1,51
2000.	457	349	806	684	273	957	1:1,19
2001.	362	147	509	668	134	802	1:1,58
2002.	404	315	719	754	235	989	1:,1,38
2003.	607	266	873	846	290	1.136	1:1,30
1999-2003.			3.537	3.656		4.838	1:1,37
2004.	695	327	1.022	961	330	1.291	1:1,26
2005.	800	398	1.198	1.126	408	1.534	1:1,28
2006.	729	414	1.143	1.029	393	1.422	1:1,24
2007.	692	387	1.079	1.029	392	1.421	1:1,32
2008.	701	350	1.051	1.133	404	1.537	1:1,46
2004-2008.			5.493	5.278		7.205	1:1,31
2009.	798	470	1.268	1.350	581	1.931	1:1,52
2010.	922	466	1.388	1.500	650	2.150	1:1,55
2011.	835	343	1.178	1.431	484	1.915	1:1,63
2012.	615	228	843	1.177	262	1.439	1:1,71
2009-2012.			4.677			7.435	
1994 – 2012.			16.459	17.261		23.578	1:1,43

Conclusion

At the end of this consideration are the presumptions of the actual increase at doe:

1. Achieved increase, real growth or growth before the hunting must be monitored and determined each year in August, in September and early October.
2. Achieved increase of the local doe population can vary considerably from year to year, so we've established for hunting ground Novi Becej that moved in the range of 0.42 to 0.91, with the average for such a long period of 0.70 fawns per doe older than 2 years, and this ratio is proposed in the development of planning documents for hunting grounds of Vojvodina.
3. Given that does are species with territorial behavior with small areal of activities, for males it is about 50 ha, and for females approximately 35 hectares (Nikolandić, 2007), the ecological characteristics of each biotope have a large effect on the rate of growth of local population. In the particular case this hunting ground is in some way representative of the majority of hunting grounds in Vojvodina and the proposed coefficient of real growth can be used in planning for all other hunting grounds in Vojvodina.
4. The number and gender ratio of fawns during May and June can be a overall information about increment, but not a data to determine the rate achieved increasement, because the springtime / summer mortality of fawns can be up to 50%, same way he is also not constant, because it varies from year to year.
5. If, during the five or more years are repeated large differences in the amount of planned and achieved growth, should during the revision of making the management plan change the coefficient of planned growth.

The average largest volume was in the 2013: Nova Crnja with 151 cm³, Senta with 150 cm³, Novi Becej with 112 cm³ and Novo Milosevo with 105 cm³. Average in CIC points of the hunted bucks in the hunting tourism for 2013. per hunting grounds was: Senta with 98.9 CIC points, Nova Crnja with 91.54 CIC points, Novi Becej with 85.29 CIC points and Novo Milosevo with CIC points, and the average buck age was in Senta 5.7 years in the Novi Becej 6.1 years and 6.9 years in Nova Crnja.

Literature

1. Almasan, H., 1967: Capriorul, mica monografie.
2. Anderson, J., 1953, Analysis of a Danish roe deer population (*Capreolus capreolus*, L.), Danish review of game biology, 2: 127–155.
3. Andersen, R., Duncan P., Linnell, J. D. C.: The European roe deer – The biology of success. 1998, Scandinavian university press, pp 1–376.
4. Danilkin, A.: Behavioral ecology of Siberian and European roe deer. 1996, Chapman and Hall wildlife ecology and behavior series, Springer, pp 1–277.
5. Gaillard, J. M., Andersen R., 1997, Family effects on growth and survival of Juvenile roe deer, Ecology, 79, 8: 2878–2889.
6. Nečas J.: Roe deer. 1972, Novi Sad, p 1-290.
7. Nikolandic, Dj., Degmecic, D., 2007, Growth at european deer (*Capreolus capreolus*, L.) in forest, Forestry Journal, 11–12, CXXXI: 565-574.
8. Nikolandic, Dj.: Ecological characteristics of deer populations at Belja. 1968, Deer - special edition, pp. 1-101.
9. Nikolandic, Dj.: Territorial behavior of deers in the woods of Haljevo, Master's thesis, 1971, Faculty of Science, University of Novi Sad. pp. 1-105.
10. Popovic, M., Djordjevic, N., Perisic, P., Beukovic, M., 2007, Fertility, losses and real growth of deers population, Modern agriculture, 56, 1-2: 218-223.
11. Ristic, Z., 1999, Determining the real growth of deers populations, Annual report on the research work by Hunting Association of Serbia. Belgrade, Novi Sad, 10-14.
12. Richter, S., Nikolandić Dj., 1982, Some remarks on the causes of death of deer, Vet. station, 4: 51-58.
13. Strandgaard, H.: The roe deer (*Capreolus capreolus* L.) population at Kalo and the factors regulating its size. 1972. pp 1–205.
14. Stubbe, C.: Rehwild. 1997, Parey Buchverleg im Blackwell Wissenschafts-Verlag, pp 1–568.