

DETERMINATION OF THE IDEAL AND THE REAL GROWTH FOR ROE DEER (*Capreolus Capreolus Linnaeus, 1758*) IN THE HUNTING GROUNDS OF VOJVODINA*

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SUMMARY: By investigations of so-called ideal growth in conditions of Vojvodina hunting grounds, a large number of non-fertilized roe does was found. The average number of fetuses-embryos per doe was 0.65, while for pregnant females it was 1.48. The average value obtained by our investigations evidently significantly differs, compared to the other authors, so these investigations should be continued for several more years. The growth of population, real growth or pre-hunting growth should be determined every year, especially after spring counting, based on previous data on general catch in specific hunting grounds. The growth of local roe deer population may considerably vary from year to year. For instance, in Novi Bečej hunting grounds it ranged from 0.42 to 0.91, with average of 0.70 fawns per doe older than 2 years. In 2013, in this hunting grounds it was 0.49, and for all four hunting grounds where the trial was set the average was 0.48. If during a five or more years large differences in planned and achieved growth are repeated, then coefficients of planned growth must be changed during revision of hunting grounds base document.

Key words: roe deer, ideal growth, real growth, embryo.

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INTRODUCTION

Roe deer (*Capreolus capreolus* Linnaeus, 1758) is a big game species belonging to ungulates (*Artiodactyla*) that inhabits more than 90% of productive hunting areas in Serbia for this type of game (Popović et al., 2007). This means that the roe deer is the most numerous and most widely spread large game species managed by hunters associations, with over 90% in total game fund of Serbia. It is estimated that presently there is between 110,000 and 130,000 specimens of roe deer in hunting grounds of Serbia. Its productive hunting area is about 4,000,000 hectares, so its population density is ranging between 2.75 and 3.35 specimens per 100 hectares. In Vojvodina, in total productive hunting area of 1,500,000 hectares, estimated roe deer number is about 45,000 individuals, which is in average 3.00 specimens per 100 hectares. However, there are certain hunting grounds where population density is over 10 specimens per 100 hectares (1 km²) and in those hunting grounds our trial has been carried out (Nova Crnja, Novo Miloševo and Novi Bečej).

Ecologically, it is a species adaptable to various habitat conditions. A century ago, it populated habitats with forests and meadows, but since then it had gradually adapted to mostly agricultural habitats of plain landscapes, where it occupies large stretch of agricultural fields without trees. In such fields, especially if sown with barley, wheat, clover, soy etc., roe deer has a good view and a control so it can easily hide. In such conditions it shows extraordinary properties and gives individuals with excellent conditions and extraordinary trophies. Therefore planning management for this type of game must be approached with extreme seriousness and competence (Ristić, 2014). The basic aim in breeding big game for hunting, in this case roe deer, is to attain maximal trophy in male individuals, respecting breeding age and capacity of the hunting grounds, i.e. to obtain optimal number with most favorable sex structure. In order to reach such goal, it is necessary to plan rational management at all levels. For breeding roe deer game, preparations of hunting grounds base document and management plans must objectively appreciate all facts from the field. Management of roe deer game is discussed by Kučančanin et al. (1994), pointing that planning must be based on several elements: a) real population growth, b) real sex structure and c) real age structure. The real population growth is the number of young individuals added to the basic number of game. It is expressed as a percent from the number of all mature roe deer in basic herd. Normal losses are not taken into account (Ristić, 2014).

Therefore the aim is not to hunt but to preserve and attain the optimal number of game in the hunting ground. In order to do that, it is necessary to hunt only the real growth, and this is to be realized if the spring count, as a way to establish the basic number, is realistically shown (Urošević et al., 2012). Otherwise unrealistic hunting may occur, which brings catastrophic consequences. Regarding the age structure, population should consist of 50% fawns, 20% immature individuals, 20% middle-aged or breeding animals and about 10% mature ones. This is certainly hard to obtain, but these are percents to aspire to. In central Serbia, real population growth is 70-85% of real number of fertile females (Urošević et al., 2012). Possibility for constant increase of production of roe deer game is limited. Having in mind interests of forestry and agriculture, it is necessary to regulate growth and limit hunting (Fišer, 1977).

MATERIAL AND METHODS

Regular breeding season of roe deer begins in second half of July, and ends mid-August. Because of delayed embryo implantation or embryonic diapause that lasts about four months, roe deer embryos are not starting development until the end of December (Linnell et al., 1998). Therefore determination of fertilization in does after breeding season (July-August) and until December-January has been done by embryo observation in does caught.

Real growth of population was established based on data from spring number of roe deer at hunting areas in Nova Crnja, Novo Miloševo, Novi Bečej and Senta. By counting roe deer, the total number was established as well as their sex and age structure. Based on total number of fawns and the parameters for fawn shot in previous hunting season, total number of fawns was calculated by adding these two values together. Also, by adding total number of roe deer counted in 2014 and shooting of roe deer in previous hunting season (2013/14), the total number of roe deer was computed for every hunting grounds. By dividing number of fawns by number of does, the real growth of roe deer population was calculated for every hunting grounds.

Investigations of embryo number were carried out in following hunting grounds: Novi Bečej, Nova Crnja, Novo Miloševo, Kanjiža, Futog and Rusko Selo. Samples were taken during a roe deer hunting season in these hunting grounds and embryos were noted. During investigations of population growth at hunting areas in Vojvodina (Nova Crnja, Novo Miloševo, Novi Bečej, Senta) number of fawns per doe before hunting season was considerably higher than planned growth rate in April for all trial sites. It is important to emphasize that population growth was planned as 60% from total number of females. This parameter occurred to be considerably lower in all three sites. Planned (expected) population growth was between 60% and 80% and it was low in comparison to realized growth before hunting season. From our results, and from results of other authors, it is notable that realized growth may considerably vary from year to year at the same area.

RESULTS AND DISCUSSION

Real population growth in trial areas was established per doe older than two years for following hunting grounds: "Koštanac" Nova Crnja – 0.50 fawns per doe, "Senčanski salaši" Senta – 0.46; "Miloševski rit" Novo Miloševo – 0.47 and "Arača" Novi Bečej – 0.49 fawns. The average real population growth for 2013 per doe older than 2 years was 0.48.

In several hunting grounds in Vojvodina (Novi Bečej, Novo Miloševo, Nova Crnja, Futog, Rusko Selo and Kanjiža) 376 shot does were inspected during 2013/14 hunting season, and results were: 86 (22.87%) does with 1 embryo, 79 (21.01%) does with 2 embryos and 211 (56.12%) does without embryos.

If a total number of does inspected is considered (376) and total number of embryos (158 from 79 two-embryo does and 86 from one-embryo does, which adds to 244 embryos), a large number of non-fertilized does is apparent. If number of embryos (244) is divided to number of does inspected (376), average number of embryos per doe was only 0.649 (rounded to 0.65). If the same number of embryos is divided to number of pregnant does

(165), average number of embryos per pregnant doe was 1.478 (rounded to 1.48). It is worrisome that more than half of shot does was without embryos (56.12%), so in further investigations we will try to find the cause of such high percent of non-fertilized does. When inspecting bagged roe deer, we will pay special attention to age and to sex ratio for each particular hunting grounds, as well as genetic traits of shot roe deer. All data are given in Table 1.

Table 1. Number of embryos in several hunting grounds in Vojvodina, hunting season 2013/14

Hunting ground/hunting organisation	Total roe deer	Gravid does	No. embryos	Fecundity per doe	Fecundity per gravid doe	Percent of Non-gravid does
Novi Bečej	22	22	44	2.00	2.00	0.00
Novo Miloševo	83	63	66	0.80	1.05	24.10
Nova Crnja	184	40	60	0.33	1.50	78.26
“Panonija” - Futog	16	6	7	0.44	1.17	62.50
“Kapetanski rit” Kanjiža	51	16	32	0.63	2.00	68.63
“Zec” Rusko Selo	20	18	35	1.75	1.94	10.00
Ukupno Total	376	165	244	0.65	1.48	56.12

In investigation by Popović et al. (2007), the average number of embryos in 2-year-old does was established as 1.14 embryos per bagged 2-year-old doe and 1.33 embryos per pregnant 2-year-old doe. In older does, average number of embryos had increased up to 2.0 embryos in 5-year-old does. Average potential fertility of does in this sample was relatively low (1.40 embryos per doe and 1.54 embryos per pregnant doe). Results obtained by Stubbe et al. (1982) are lower than in investigations by Kurt (1968), who had found 1.85 embryos per pregnant doe. Results obtained by Pielowski (1984) shows that Stubbe and Passarge (1979) had found 1.90 embryos; Strandgaard (1972) between 1.57 and 2.08, and Bobek et al. (1974) found 1.7 embryos etc.

Based on presented results of Stubbe et al. (1982) investigations of embryo number per pregnant doe were done in England by Harnilton et al. (1960) who found 1.8 embryos; Short et al. (1966) – 1.8; Chapil et al. (1966), Prior (1968), Chapman et al. (1971) – 1.9; Holmes (1973) – 1.7; in Danish hunting grounds Andersen (1953) found 1.9 embryos; in Sweden Essen (1966) – 2.3 and Borg (1970) – 2.2; in Hungarian hunting grounds Fodor et al. (1979) – 2.0 and Szederjei et al. (1971) – 1.4, etc. The population growth rate is an important element of population dynamics, and it is determined by the time of reaching sexual maturity, the ratio of females participating in breeding and the average number of fawns per doe. Rate of fertilization (number of embryos per doe), brood (number of fawns immediately after birth), fawn losses in first 5 or 6 months and realized/fall number before hunting season are important parameters that should be known and respected in management of roe deer population. In several European countries, a high fertilization rate was confirmed in roe deer, using method of inspection of embryos (Danilkin, 1996). For instance, in Lithuania only 3.4% females were not fertilized, and in Poland between 1.6%

and 14% (Danilkin, 1996). In Denmark, percent of unfertilized females was between 0 and 5% (Strandgaard, 1972), in Romania 14% (Almasan, 1967). Regarding the number of fawns immediately after birth, in roe deer it is mostly two fawns, occasionally one fawn and very rarely three. In Romania, investigations confirmed that in 78% cases doe has two fawns, in 19.4% cases one fawn and in 2.6% cases three fawns (Almasan, 1967). All these data regarding reproductive potential of roe deer are impressive, but the most important parameter in management of roe deer population is the number of fawns in comparison to total number of does in fall (September-October) before the start of the hunting season, i.e. so-called real growth.

Number of fawns per doe in fall is considerably lower than number of fawns born (May-June). Results presented by Nikolandić and Degmečić (2007) indicate that rates of survival of fawns between spring and fall ranges from 78% in Denmark (Strandgaard, 1972), 68% in England, 53% in Switzerland, 57% to 93% in Germany to between 38% and 84% in France (Galliard et al., 1998). Mortality in roe deer is distinctly high during the first spring/summer period, even up to 50% (Strandgaard, 1972). In Germany, during a first week of life up to 10% fawns is lost (Stubbe, 1997) and in Poland total mortality between May and November was 37.6% (Danilkin, 1996).

In Vojvodina, based on investigations in four year period in five hunting grounds (Ristić, 1999), population growth had varied, depending on hunting grounds and year, between 0.45 and 0.90 fawns per breeding doe, and in average for the whole period and all hunting grounds it was 0.63% (per breeding doe older than two years) which is only 31% of total number of roe deer game. Average growth in Czech Republic, according to Nečas (1972) was from 80% to 120%, although in more severe conditions brood of fawns was not higher than 40-50%.

After investigations by Popović, et al. (2007), the real population growth varies, depending on year and the hunting grounds, between 0.65 and 1.1 fawns per doe (2 years old or older). Average real growth for period investigated was 0.86 fawns per breeding doe. In paper by Ristić et al. (2013) for 1994-2012 period in Novi Bečej hunting grounds, average coefficient of real growth was 0.7 fawns per doe (2 years old or older); maximum was noted in 1997 – 0.91 fawns per doe, and minimum in 2001 and 2012 – only 0.42 fawns per doe. In 2012, year that will be noted as the most arid year in these parts, it was confirmed that drought had significant effect on survival of fawns, but increased number of predators also had effect in such low growth of population. Regarding sex structure, it ranged between 1:1.19 and 1:1.71 in favor of females, and for the whole period it was 1:1.43 which is quite satisfactory. When analyzing real growth in roe deer after counting (by method of total count) in spring at the whole trial area (March-April), adding shot does (who had birth) and shot fawns for every hunting season between 1994 and 2012, somewhat lower growth is noted – 0.69 fawns per doe older than 2 years.

CONCLUSION

Based on the present study and the study of other authors, it can be listed the following facts in connection to so-called ideal and real growth in roe deer for several hunting grounds in Vojvodina in 2013:

1. In 2013/14 hunting season (between the end of December 2013 and January 2014), 376 does were inspected and 244 embryos were found. These investigations established a large number of non-fertilized does (211). Average number of embryos per doe was 0.649 (rounded to 0.65). Average number of embryos per pregnant doe was 1.478 (rounded to 1.48).

2. Real growth or pre-hunting growth must be monitored and established every year at the end of August, during September and at the beginning of October, and especially after spring count, and also using data about shot accomplished.

3. Real growth of local roe deer population may considerably vary from year to year. For instance, at Novi Bečej hunting grounds it ranged between 0.42 and 0.91, with averagely 0.70 fawns per doe older than 2 years. In 2013, value for this hunting ground was 0.49, and for all four hunting grounds where trial was set average is 0.48. It is evident that the average is much smaller than established for conditions in our hunting grounds in previous period. Therefore it is recommended, based on given methodology, that hunting grounds management determine these parameters every year and to calculate this element which will be used in preparing the management plans.

4. Having in mind that roe deer is strictly territorial game species with small activity area – about 50 hectares for males and 35 hectares for females (Nikolandić and Degmečić, 2007) – ecological characteristics of certain biotopes have considerable effect on growth rate of local populations. In this case, these hunting grounds are representative for most Vojvodina hunting grounds and recommended coefficient of real growth may be used in planning for all other hunting grounds in Vojvodina.

5. Number and sex ratio of fawns observed during May and June may be used only as a general information about population growth, but not as data in establishing rate of real growth, since spring/summer mortality of fawns may be even up to 50%, and it also varies from year to year.

6. If during a five or more years large differences in planned and achieved growth are repeated, then coefficients of planned growth must be changed during revision of hunting grounds base document.

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UTVRĐIVANJE IDEALNOG I REALNOG PRIRASTA SRNA
(*Capreolus Capreolus Linnaeus, 1758*)
U LOVIŠTIMA VOJVODINE

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Izvod

Istraživanjima tzv. idealnog prirasta za uslove lovišta Vojvodine utvrđen je veliki broj neoplođenih srna. Prosečan broj fetusa-embriona po srni iznosio je 0,65 dok je ovaj prosek po bremenitoj - gravidnoj srni iznosio 1,48. Istraživanjima broja fetusa-embriona po gravidnoj srni u Engleskoj bavili su se: Barnilton et al. (1960) i dobili rezultat od 1,8; Short et al. (1966) - 1,8; Chapil et al. (1966), Prior (1968), Chapman et al. (1971) - 1,9; Holmes (1973) - 1,7; za Danske uslove lovišta Andersen (1953) je utvrdio - 1,9; u Švedskoj su utvrdili Essen (1966) - 2,3 i Borg (1970) - 2,2; za uslove mađarskih lovišta Fodor et al. (1979) - 2,0 i Szederjei et al. (1971) - 1,4, itd. Evidentno je da je ovaj prosek, dobijen na osnovu naših istraživanja, značajno odstupao, te sa ovakvim istraživanjima treba nastaviti još nekoliko godina. Ostvareni prirast, realni prirast ili prirast pred lov, treba utvrđivati svake godine posebno nakon prolećnog brojanja i na osnovu sopstvenih podataka o izvršenom odstrelu u tom lovištu. Ostvareni prirast lokalne populacije srna može značajno varirati od godine do godine, tako da za lovište Novi Bečej se kretao u dijapazonu od 0,42 do 0,91, sa prosekom za ovako dugačak period od 0,70 lanadi po srni starijoj od 2 godine. U 2013. godini, za ovo lovište ovaj parametar je iznosio 0,49, a za sva četiri lovišta, na kojima je bio postavljen ogled, prosek je iznosio 0,48. Ako se tokom pet ili više godina ponavljaju velike razlike u visini planiranog i ostvarenog prirasta, treba prilikom revizije izrade lovne osnove promeniti i koeficijente planiranog prirasta.

Ključne reči: srna, idealni prirast, realni prirast, embrion.

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