Basic morphometric parameters of antlers in Roe deer (*Capreolus capreolus* L.) from imperial hunts in the Białowieża Primeval Forest

Milivoje Urošević*, Milosava Matejević and Panče Dameski

Abstract

Roe deer (*Capreolus capreolus* L.) is adaptable to various habitat conditions and is widespread across Europe. The Białowieża Primeval Forest is an area in the moderate zone of lowland Europe and it is habitat for different game species. For the purposes of this study, the morphometric parameters of roe deer antlers shot in the Białowieża Primeval Forest by the Russian Czar Nicholas II during his reign (1894-1917) were analysed. Length of left and right beams, circumference of the left and right coronets, circumference of the left and right, length of the first and second tine end of the left and right beams, and inside span were measured and analysed. The results showed that during the imperial roe deer hunts in the period 1894 to 1917 in Białowieża Primeval Forest, individuals of similar morphometric trophy characteristics were hunted. The trophies were, on average, characterized by a slightly longer left beam, uniform beam circumference, coronet circumference, and very similar tine ends lengths.

Key words: trophy; antlers; roe deer; Białowieża Primeval Forest

Introduction

Roe deer (*Capreolus capreolus* L.) is adaptable to various habitat conditions (Ristic et al., 2014) and is widespread across Europe (Janiszewski et al., 2016; Sönnichsen et al., 2017). A century ago, roe deer habitats were forests and meadows, though later this species was required to adapt to mostly agricultural habitats of plain landscapes (Ristic et al., 2014).

The Białowieża Primeval Forest is an area in the moderate zone of lowland Europe (Okarma et al., 1995) and it is habitat for different game species
(European bison, moose, red deer, roe deer, wild boar, wolf and lynx). From the 15th to the late 18th century, Białowieża Forest was protected as a royal hunting forest of the Polish kings and Lithuanian dukes, and later, until 1914, it was a protected forest for the imperial hunts of the Russian czars (Jędrzejewska et al., 1997). Jędrzejewska et al. (1994, 1997) state that after 1860, the Białowieża Primeval Forest became the czar’s hunting ground, with intense modern hunting management based on the extermination of predators, and the promotion and reintroduction of ungulates. However, Jędrzejewska et al. (1997) also pointed to the period from 1915 to 1920, during World War I and the Polish-Soviet War, when there was a significant reduction in the populations of various game species, including European roe deer, in Białowieża Primeval Forest (East Poland).

To obtain an overview of the impression of the quality of the trophies shot in the imperial hunts, we give the example of the world champion, a roe deer shot in Hungary that was evaluated at an exhibition in Novi Sad (Serbia) in 1967. This trophy had a left bar length of 32.40 cm and a right of 28.50 cm (Briedermann et al., 1981). The same authors state that the strongest trophy in the German Democratic Republic in 1969 had a left bar length of 26.70 cm and the right of 29.00 cm. Analysing gold medal roe deer antlers in the period 1960–1969, Bakkay et al. (1971) stated that the best rated antlers, shot in 1968 in Hungary, had a left bar length of 27.80 cm and a right bar of 28.60 cm.

Results and Discussion

The absolute values of the left beam length ranged from 12 cm to a maximum of 26 cm, while the mean value of the left beam length was $M=19.45$ (SD=3.13). The mean value of the right beam length was $M=18.42$ (SD=5.37). More than half of the roe deer in the observed sample had a length of left beam up to 20 cm (63.8%). The largest percentage of individuals from the sample had a left beam length of 19.5 cm (13.8%) or 21.5 cm (13.8%). For the right beam, 60% of the roe deer in the sample had a right beam up to 20 cm long. The largest percentage of individuals from the sample had a right beam length of 19.5 cm (13.8%) or 21.5 cm (13.8%). For the right beam, 60% of the roe deer in the sample had a right beam up to 20 cm long. The largest percentage of individuals from the sample had a right beam length of 17.5 cm (10.9%) or 19 cm (10.9%). Thus, the results show that the left horn is slightly longer on average.

However, observing the circumference of each beam separately, their values are on average very similar. The average value of the left beam circumference was $M=5.63$ (SD=1.17), while the average right beam...
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Table 1. Descriptive statistics (in cm)

| Parameter                              | N  | Minimum | Maximum | Mean  | Std. Deviation |
|----------------------------------------|----|---------|---------|-------|----------------|
| Length of left beam                    | 58 | 12.00   | 26.00   | 19.45 | 3.13           |
| Length of right beam                   | 55 | 7.00    | 25.00   | 19.43 | 3.24           |
| Left coronet circumference             | 58 | 6.50    | 14.50   | 10.82 | 1.65           |
| Right coronet circumference            | 57 | 6.50    | 14.50   | 10.81 | 1.61           |
| Left beam circumference                | 58 | 3.00    | 11.00   | 5.63  | 1.17           |
| Right beam circumference               | 56 | 4.00    | 8.50    | 5.72  | .869           |
| Length of the first tine end of left beam | 50 | 0.50    | 8.00    | 3.63  | 2.01           |
| Length of the first tine end of right beam | 51 | 0.50    | 8.50    | 3.77  | 2.06           |
| Length of the second tine end of left beam | 46 | 0.50    | 6.50    | 2.88  | 1.51           |
| Length of the second tine end of right beam | 46 | 0.50    | 6.50    | 2.88  | 1.51           |
| Inside span                            | 51 | 4.00    | 15.00   | 9.27  | 2.32           |
| Valid N (listwise)                     | 35 |         |         |       |                |

Table 2. Correlation results between the left beam elements

| Parameter                              | Length of left beam Correlation | Length of the first tine end of left beam Correlation | Length of the second tine end of left beam Correlation | Left coronet circumference Correlation | Left beam circumference Correlation |
|----------------------------------------|---------------------------------|------------------------------------------------------|-------------------------------------------------------|--------------------------------------|-------------------------------------|
| Length of left beam                    | Pearson Correlation             | 1                                                   | 0.42**                                                | 0.21                                 | 0.62**                              |
|                                       | Sig. (2-tailed)                 | 0.00                                                | 0.19                                                 | 0.00                                 | 0.00                                |
|                                       | N                               | 58                                                  | 50                                                   | 40                                   | 58                                  |
| Length of the first tine end of left beam | Pearson Correlation             | 0.42**                                              | 1                                                    | 0.23                                 | 0.28**                              |
|                                       | Sig. (2-tailed)                 | 0.00                                                | 0.16                                                 | 0.05                                 | 0.00                                |
|                                       | N                               | 50                                                  | 50                                                   | 37                                   | 50                                  |
| Length of the second tine end of left beam | Pearson Correlation             | 0.21                                                | 0.23                                                 | 1                                    | 0.25**                              |
|                                       | Sig. (2-tailed)                 | 0.19                                                | 0.16                                                 | 0.12                                 | 0.04                                |
|                                       | N                               | 40                                                  | 37                                                   | 40                                   | 40                                  |
| Left coronet circumference             | Pearson Correlation             | 0.62**                                              | 0.28                                                 | 0.25                                 | 1                                   |
|                                       | Sig. (2-tailed)                 | 0.00                                                | 0.05                                                 | 0.12                                 | 0.00                                |
|                                       | N                               | 58                                                  | 50                                                   | 40                                   | 58                                  |
| Left beam circumference                | Pearson Correlation             | 0.45**                                              | 0.51**                                               | 0.33*                                | 0.58**                              |
|                                       | Sig. (2-tailed)                 | 0.00                                                | 0.00                                                 | 0.04                                 | 0.00                                |
|                                       | N                               | 58                                                  | 50                                                   | 40                                   | 58                                  |

** Correlation significant at the 0.01 level (2-tailed)
* Correlation significant at the 0.05 level (2-tailed)
circumference was $M=5.53$ (SD=1.36). The highest percentage of specimens from the sample (29.3%) had a left beam circumference of 6 cm, and similar results were found for right beam circumference. The largest percentage of specimens from the sample (30.4%) had a right beam circumference of 6 cm.

As for coronet circumference, the mean values of this parameter for both beams were very similar. The circumference of left coronets was on average $M=10.82$ (SD=1.65), while the mean value of right coronet circumference was $M=10.81$ (SD = 1.61). More than half of the roe deer in the observed sample had a left coronet circumference (60.3%) and 56.1% had a right coronet circumference up to 11 cm.

Table 1 shows that the average length of the first tine ends of beams were also very similar. The mean value of the length of the first tine ends of the left beam was $M=3.63$ (SD=2.01), and of the right beam was $M=3.77$ (SD=2.06). As for the second tine end, on average it was slightly shorter than the first. On the left beam, the average value was $M=3.25$ (SD=1.39), and on the right beam was $M=2.88$ (SD=1.51).

The mean value of the distance between the left and right beams (inside span), measured between their peaks, was $M=9.27$ (SD=2.32). The minimum value of this distance was 4 cm and
maximum was 15 cm. Observing the frequency of the values of this distance, it can be noticed that a significantly small percentage of roe deer in the total sample had a distance greater than 11 cm. The largest number of roe deer had a distance of 10 cm (15.7%) or 11 cm (13.7%) between the horns. In total, 86.3% of roe deer had a distance less than 11.5 cm.

Table 2 shows that there is a statistically significant positive correlation between the left beam length and the length of the first tine ends of the left horn, and between left beam length and the left beam circumference and left coronet circumference.

Table 3 shows similar results for the right beam elements. There is a statistically significant positive correlation between the right beam length and the length of the first and second tine ends of the right beam, and between right beam length and right beam circumference and right coronet circumference.

Conclusions

The results showed that during the imperial roe deer hunts in the period from 1894 to 1917 in the Białowieża Primeval Forest, individuals of similar morphometric characteristics of trophies were hunted. The trophies were, on average, characterized by a slightly longer left beam, uniform beam circumference and coronet circumference, and very similar tine end lengths.

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Osnovni morfometrijski parametri rogova europskih srnjaka
(Capreolus capreolus L.) odstrijeljenih tijekom carskog lova u
stoljetnoj šumi Białowieża

Dr. agr. sc. Milivoje UROŠEVIĆ, dr. med. vet. spec., COAR – centar za očuvanje autohtonih
rasa, Beograd, Srbija; dr. sc. Milosava MATEJEVIĆ, dipl. ing., docentica, Prirodno-matematički
fakultet, Univerzitet u Novom Sadu, Novi Sad, Srbija; dr. sc. Panče DAMESKI, dr. med. vet.,
docent, Veterinarski fakultet, Bitola, Univerzitet “St. Kliment Ohridski”, Bitola, Republika
Sjeverna Makedonija

Europski srnjak (Capreolus capreolus L.) je prilagodljiv različitim uvjetima staništa
i rasprostranjen je diljem Europe. Stoljetna šuma Białowieża područje je u umjerenoj
zoni nizinske Europe te predstavlja stanište različitoj divljači. U svrhu ovog istraživanja,
analizirani su morfometrijski parametri rogova europskih srnjaka odstrijeljenih u
stoljetnoj šumi Białowieża od strane ruskog cara Nikole II. tijekom njegove vladavine
(1894. – 1917.). Mjerene su i analizirane duljina lijevog roga, duljina desnog roga, opseg lijevog
vijenca, opseg desnog vijenca, opseg lijevog roga, opseg desnog roga, duljina vrha prvog
i drugog paroška lijevog roga, duljina vrha prvog i drugog paroška desnog roga, unutarnji
raspon. Rezultati su pokazali da su se tijekom carskog lova na europske srnjake u razdoblju
od 1894. do 1917. u stoljetnoj šumi Białowieża lovile jedinke sličnih morfometrijskih
karakteristika trofeja. Trofeji su u prosjeku bili okarakterizirani malo duljim lijevim rogom,
jednoličnim opsegom roga, opsegom vijenaca, kao i vrlo sličnim duljinama vrhova parožaka.

Ključne riječi: trofej, rogovi, europski srnjak,
stoljetna šuma Białowieża