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

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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

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(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.

Methodology and materials

For the purposes of this study, the morphometric parameters of roe deer antlers shot by the Russian Czar Nicholas II during his reign (1894–1917) were analysed. All data were obtained from the Catalogue of the Darwin Museum in Moscow (Miloserdov, 2016). Roe deer were shot in the Belovezhskaya Forest (today in the territory of Poland). The research was conducted on a sample of 58 antlers. The parameters (length of left and right beam, circumference of left and right coronets, circumference of left and right beams, length of the first and second tine end of the left and right beams, and inside span) were measured in accordance with the requirements of International Council for Game and Wildlife (CIC). The data were first processed using the descriptive statistics method, and then the Pearson correlation method was applied to determine dependence between the observed parameters. The collected data were processed using the Statistical Package for the Social Sciences (SPSS) software for Windows Release 23.

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 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

Table 1. Descriptive statistics (in cm)

	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	40	0.50	5.50	3.25	1.39
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

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

** Correlation significant at the 0.01 level (2-tailed)
* Correlation significant at the 0.05 level (2-tailed)

Table 3. Correlation results between right beam elements

		Length of right beam	Right coronet circumfer-ence	Right beam circumfer-ence	Length of the first tine end of right beam	Length of the second tine end of right beam
Length of right beam	Pearson Correlation	1	0.52**	0.53**	0.41**	0.31*
	Sig. (2-tailed)		0.00	0.00	0.003	0.03
	N	55	55	55	51	46
Right coronet circumference	Pearson Correlation	0.52**	1	0.63**	0.34*	0.45**
	Sig. (2-tailed)	0.00		0.00	0.02	0.00
	N	55	57	55	51	46
Right beam circumference	Pearson Correlation	0.53**	0.63**	1	0.59**	0.60**
	Sig. (2-tailed)	0.00	0.00		0.00	0.00
	N	55	55	56	51	46
Length of the first tine end of right beam	Pearson Correlation	0.41**	0.34*	0.59**	1	0.42**
	Sig. (2-tailed)	0.00	0.02	0.00		0.00
	N	51	51	51	51	45
Length of the second tine end of right beam	Pearson Correlation	0.31*	0.45**	0.60**	0.42**	1
	Sig. (2-tailed)	0.03	0.00	0.00	0.00	
	N	46	46	46	45	46

** 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

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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*