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QUALITY OF RED DEER (*CERVUS ELAPHUS*) STAGS HARVESTED IN THE HUNTING GROUNDS OF THE TUCHOLA FOREST

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Abstract. The aim of the present study was to characterize red deer stags harvested in the hunting grounds of the Tuchola Forests, based on carcass weight and antler weight and type. It was found that the average weight of carcass and antlers of stags harvested over the study period was 95.78 kg and 2.05 kg respectively. Eight-point stags and spickers were encountered most frequently (33.28% and 21.43% respectively). The average carcass weight of stags representing particular age groups was as follows: group I – 89.65 kg, group II – 120.29 kg, group III – 136.62 kg. Antler weight in the above age groups reached 1.66 kg, 3.55 kg and 5.90 kg respectively.

Key words: red deer, carcass weight, antler weight, antler type

INTRODUCTION

Studies on the red deer conducted to date suggest that several ecotypes differing in size and body conformation may be distinguished within this species [Dzięciołowski 1969, Kubacki and Jamroży 1999, Łabudzki 1993]. Therefore, it seems interesting to investigate whether an ecotype associated with the Tuchola Forest complex can be distinguished within the red deer population dwelling in north-eastern Poland. Taking into account the area and environmental conditions of the Tuchola Forests, it seems that the red deer living there may constitute a separate subpopulation. According to Dzięgielewski [1973], differences in the size of red deer result from the local type, while Bobek et al. [1984] and Borkowski [1998] share the opinion that the carcass weight of red deer is affected by a variety of factors, including the availability of food resources and population densities.

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The aim of the present study was to characterize red deer stags harvested in the hunting grounds of the Tuchola Forests, in respect of carcass weight and antler quality, as well as to compare them to male deer from other regions of Poland.

MATERIALS AND METHODS

The Tuchola Forests, also referred to as the Tuchola Plain, are located between 17°30´ and 18°35´ east longitude and between 54° and 53°40´ north latitude. They lie between the Wda and Brda Rivers. The breeding area "Tuchola Forest" covers 416 499 km², including 50.32% of arable land, 45.13% of woodland and 4.55% of land used for other purposes. Pine forests account for nearly 93.62% of the stand [Kondracki 2002, Trampler et al. 1990].

The experimental materials comprised the carcasses and antlers of 616 red deer stags harvested in the hunting grounds of the Tuchola Forests. The information about the carcass weight and the weight and type of antlers comes from harvest records regarding male deer, kept at the District Board of the Polish Hunting Association in Bydgoszcz. The data were collected during six hunting seasons: 1997/1998, 1998/1999, 1999/2000, 2001/2002, 2002/2003 and 2004/2005 (Table 1).

Table 1. Number of carcasses and antlers of red deer stags analysed during successive hunting seasons
Tabela 1. Liczba tusz i poroży byków przeanalizowanych w poszczególnych sezonach łowieckich

Hunting season Sezony łowieckie	1997/1998	1998/1999	1999/2000	2001/2002	2002/2003	2004/2005	Total Razem
Stags [ind.] Byki [osob.]	20	72	136	145	136	107	616

The stags were divided into three age categories, in accordance with the current wildlife management regulations:

– group I – stags aged 2 to 5 years – 499 animals,
– group II – stags aged 6 to 10 years – 111 animals,
– group III – stags aged 11 years and older – 6 animals.

The age of stags was estimated by game commissions for the control of male deer harvest, based on the replacement and wear of teeth of the lower jaw.

Numerical data were processed statistically with the use of STATISTICA 5.0 PL software, taking into account the statistical characteristics of carcass weight and antler weight ($\bar{x}$ and s) as well as the significance of differences between mean values of those traits in particular hunting seasons. Coefficients of correlation (r) between carcass weight and antler weight were also calculated [Bochno et al. 2001].

RESULTS AND DISCUSSION

The average carcass weight of the analysed stags was 95.78 kg (Table 2) and varied from 94.07 kg in the 1998/1999 season to 96.96 kg in the 2004/2005 season. Differences between those values were statistically non-significant. This suggests that the red deer stag population dwelling in the Tuchola Forests is stable in terms of carcass weight.

An analysis conducted by Żurkowski et al. [2000] over the hunting season 1997/1998 in the Pisz Forests revealed that the average carcass weight of deer stags was higher, reaching 108 kg. Also deer stags harvested in other hunting grounds of Warmia and Mazury during the 1986/1987 – 2000/2001 seasons had higher carcass weight – 114.5 kg [Janiszewski and Szczepański 2004]. The average carcass weight of male deer shot in the Carpathians was even higher – 133.9 kg [Brewczyński 2002]. A comparison of those values with the current results shows that deer living in the Carpathians are characterized by higher average body weight than deer dwelling in other regions of Poland, and stags harvested in the Tuchola Forest are the lightest. This confirms that the body weight of red deer stags dwelling in Poland varies within a relatively wide range, depending on the area.

Table 2. Average weight of carcass and antlers of red deer stags harvested in the Tuchola Forests during particular hunting seasons
Tabela 2. Średnia masa tuszy i poroża byków z Borów Tucholskich pozyskanych w poszczególnych sezonach łowieckich

Trait Cecha	Statistical measures Miary statystyczne	Hunting season – Sezon łowiecki						Total Ogółem
		1997/1998	1998/1999	1999/2000	2001/2002	2003/2004	2004/2005	
Carcass weight kg Masa tuszy kg	N	20	72	136	145	136	107	616
	$\bar{x}$	95.05	94.07	96.60	96.57	94.26	96.96	95.78
	S	19.99	26.16	22.34	22.28	24.13	25.15	23.57
	min.	60	47	52	58	49	48	47
	max.	128	162	180	154	169	176	180
Antler weight kg Masa poroża kg	N	20	72	136	145	136	107	616
	$\bar{x}$	2.24	1.88	1.99	2.22	1.95	2.12	2.05
	S	0.95	0.98	1.05	1.43	1.22	1.24	1.21
	min.	0.66	0.12	0.34	0.27	0.16	0.40	0.12
	max.	4.20	5.30	5.70	7.78	7.54	6.16	7.78

No statistically significant differences.
Brak statystycznie istotnych różnic.

The average antler weight of 616 stags harvested in the Tuchola Forests was 2.05 kg (Table 2), and differences observed within this trait in particular hunting seasons were statistically non-significant.

A comparison of the average weight of antlers of male deer harvested in the 1999/2000 and 2000/2001 seasons in the Carpathians [Brewczyński 2002] and in the Tuchola Forests indicates that the antlers of Carpathian stags are almost twofold heavier (4.03 kg). Żurkowski et al. [2000] reported that the average antler weight of red deer stags shot in the hunting grounds of the Pisz Forest was 2.7 kg. This value is comparable to that determined in the present study, but it should be stressed that the findings of the above authors concern a relatively short period of time.

The average weight of carcass and antlers of stags representing particular age groups was as follows: group I – 89.65 kg and 1.66 kg, group II – 120.29 kg and 3.55, group III – 136.62 kg and 5.90 kg respectively (Table 3). The data presented in Figure 1 show that the difference in carcass weight was greater between age groups I and II (30.64 kg on average) and smaller between age groups II and III (16.33 kg). A different trend was observed in the growth rate of antlers. The difference in antler weight between age groups II and III was 2.35 kg on average, and between age groups I and II – only 1.89 kg.

Table 3. Average, maximum and minimum weight of carcass and antlers of red deer stags in particular age groups, kg
Tabela 3. Średnia, maksymalna i minimalna masa tuszy i poroża analizowanych byków w poszczególnych klasach wiekowych, kg

Trait Cecha	Statistical measures Miary statystyczne	Age group – Klasy wiekowe		
		I	II	III
Carcass weight Masa tuszy	N	497	111	8
	$\bar{x}$	89.65	120.29	136.62
	S	19.53	21.37	22.21
	min.	47	63.00	102.00
	max.	148.00	180.00	169.00
Antler weight Masa poroża	N	497	111	8
	$\bar{x}$	1.66	3.55	5.90
	S	0.80	1.08	1.16
	min.	0.12	1.65	4.63
	max.	4.59	7.78	7.78

Łabudzki [1993] demonstrated that deer stags of the Wielkopolska population are characterized by the highest weight of carcass and antlers at the age of 11. The average carcass weight of 11-year-old stags reaches 132.64 kg, and decreases to 117.80 kg in those aged 14 years. According to Żurkowski et al. [2000], the growth of antlers of deer stags dwelling in the Pisz Forests is completed at 7 years of age, and antler weight remains at a stable level from 7 to 10 years of age. The data presented in Table 3 and Figure 1 show that the development of male deer from the Tuchola Forests takes longer. However, in both populations the final weight of antlers was found to be comparable – 5.6 kg in the study conducted by Żurkowski et al. [2000] and 5.9 kg in the current study.

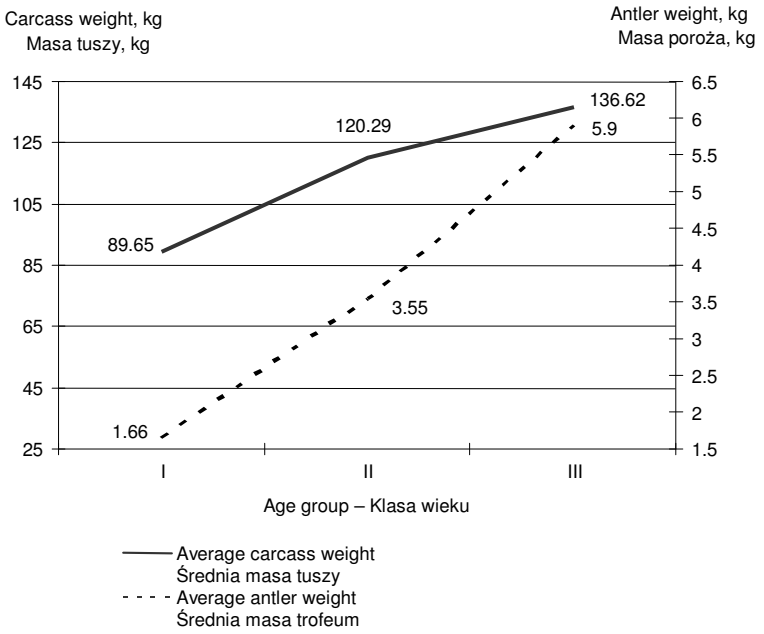

Fig. 1. Average weight of carcass and antlers of red deer stags in particular age groups
Rys. 1. Średnia masa tuszy i średnia masa poroża byków w poszczególnych klasach wiekowych

It should be noted that the observed changes in carcass weight were directly proportional to average antler weight (Fig. 2). For instance, the lowest average weight of carcass (94.07 kg) and antlers (1.88 kg) was recorded in the hunting season 1998/1999. This is consistent with the results of previous research which revealed that antler weight is dependent on carcass weight – heavier stags carry heavier antlers [Drozd et al. 2000, Dzięgielewski 1973, Bobek et al. 1992]. Also Łabudzki [1993] observed highly significant correlations between carcass weight and antler weight in the red deer.

The coefficient of correlation between carcass weight and antler weight in the entire population of red deer stags dwelling in the Tuchola Forests was high and reached 0.76 ($P \leq 0.01$; Table 4). This coefficient was lower in particular age categories, and in age group 3 it was found to be statistically non-significant. Identical relationships were reported by Żurkowski et al. [2000]. In a study conducted by those authors on a population of red deer stags harvested in the Pisz Forests, the coefficient of correlation between carcass weight and antler weight was equal to 0.74, and its values were substantially lower in individual age categories. Drozd et al. [2000] obtained a correlation coefficient of 0.72 for a red deer population from Central and Eastern Poland. A somewhat higher coefficient of correlation between carcass weight and antler weight, reaching 0.86, was obtained for deer stags dwelling in the region of Lasy Taborskie (the Tabor Forest) [Janiszewski and Kolasa 2006]. This suggests that the values of the coefficient of correlation between carcass weight and antler weight remain at a similar level, regardless of the variation within those traits observed in different local deer subpopulations.

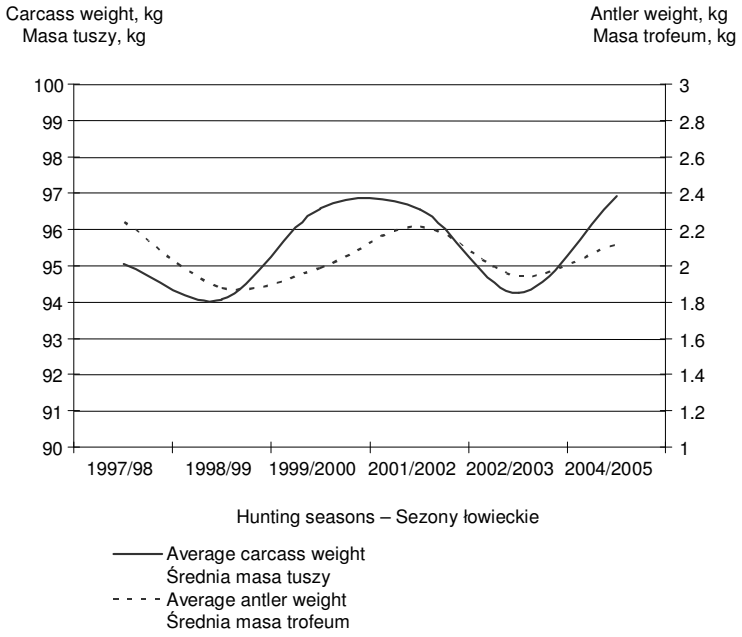

Fig. 2. Average weight of carcass and antlers of red deer stags in particular hunting seasons
Rys. 2. Średnia masa tuszy i poroża byków w sezonach badawczych

Table 4. Coefficients of correlation between carcass weight and antler weight in red deer stags
Tabela 4. Współczynnik korelacji pomiędzy masą tuszy i masą poroża jeleni byków

Age group – Klasa wieku	N	r
I	497	0.42*
II	111	0.59*
III	8	0.33
Total – Ogółem	616	0.76*

*P ≤ 0.01.
*P ≤ 0,01.

The current results also indicate that changes in antler type are accompanied by changes in antler weight, which increases proportionally to the increment in carcass weight (Table 5). No such correlation was observed only in the case of spickers and 16-point stags.

Table 5. Average carcass weight, average antler weight and antler types in red deer stags dwelling in the Tuchola Forests
Tabela 5. Średnia masa tuszy i średnia masa poroża byków z Borów Tucholskich z uwzględnieniem formy poroża

Antler type – Forma poroża	Average carcass weight Średnia masa tuszy kg	Average antler weight Średnia masa poroża kg
Spickers – Szpicaki	72.16	0.74
Prickets – Szydlarze	65.33	0.76
Fork stags – Widłaki	62.25	0.99
6-point stags – Szóstaki	91.48	1.58
8-point stags – Ósmaki	100.93	2.19
10-point stags – Dziesiątaki	111.52	3.15
12-point stags – Dwunastaki	122.31	3.74
14-point stags – Czternastaki	137.89	5.34
16-point stags – Szesnastaki	130.00	6.74
Mean – Średnio	95.78	2.05

The data illustrated in Figure 3 show that 8-point stags and spickers were encountered most frequently in the Tuchola Forests, accounting for respectively 33.28% and 21.43% of the total population, while 6-point, 10-point and 12-point stags made up 17.37%, 16.07% and 5.68%. The percentage of other antler types was low.

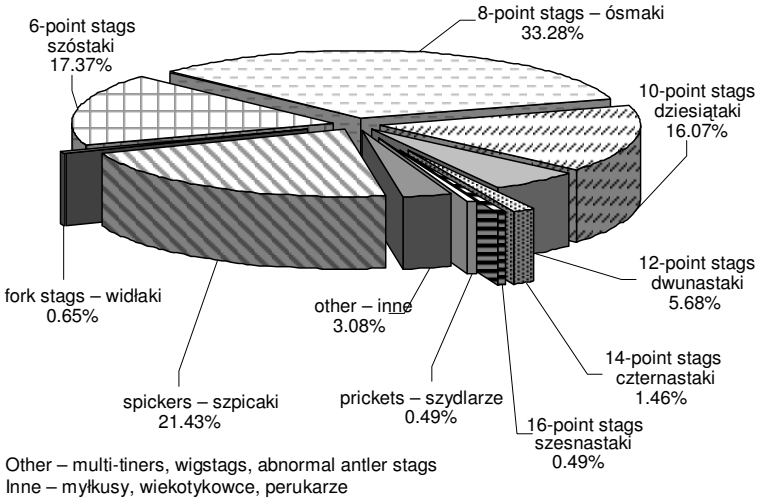

Fig. 3. Percentages of particular antler types in the red deer stag population in the Tuchola Forests
Rys. 3. Procentowy udział poszczególnych form poroża byków z łowisk Borów Tucholskich

A study involving 622 stags harvested in the vicinity of the town of Krosno showed that 32.31% of male deer carried eight-point antlers, whereas ten-point stags, six-point stags, spickers and 12-point stags accounted for 26.36%, 15.27%, 8.03% and 6.91% of the tested population [Brewczyński 2002]. Similar results were reported by Żurkowski et al. [2000]. Those authors found that a red deer population living in the Pisz Forests was dominated by eight-point and ten-point stags (over 30% and 26% respectively). The above data indicate that stags carrying eight-point antlers are most common in the Tuchola Forests, in the Carpathians and in the Pisz Forests. However, the number of stags with antlers of poorer quality is higher in the Tuchola Forests, compared to the other two regions.

Based on the results of the current study, conducted in the hunting grounds of the Tuchola Forests over eight hunting seasons, the following conclusions can be drawn:

- The average weight of carcass and antlers of stags harvested in the Tuchola Forests during the study period was 95.78 kg and 2.05 kg respectively.
- Eight-point stags and spickers were encountered most frequently (33.28% and 21.43% respectively).
- The average carcass weight of stags representing particular age groups was as follows: group 1 – 89.65 kg, group 2 – 120.29 kg, group 3 – 136.62 kg.
- Antler weight increased with age, reaching 1.66 kg, 3.55 kg and 5.90 kg in age groups 1, 2 and 3 respectively.
- The population of red deer stags dwelling in the Tuchola Forests was characterized by lower carcass weight and relatively low antler weight, compared to male deer harvested in other regions of Poland.

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JAKOŚĆ BYKÓW JELENIA SZLACHETNEGO (*CERVUS ELAPHUS*) BYTUJĄCEGO W BORACH TUCHOLSKICH

Streszczenie. Celem prowadzonych badań było scharakteryzowanie byków jelenia szlachetnego bytującego w Borach Tucholskich na podstawie masy ich tuszy oraz masy i formy poroża. Stwierdzono, że średnia masa tuszy analizowanych byków w okresie badawczym wyniosła 95,78 kg, przy średniej masie ich poroża 2,05 kg. Najczęstszymi formami poroża u badanych samców były ósmaki (33,28%) oraz szpicaki (21,43%). Średnia masa tuszy byków w poszczególnych klasach wiekowych wyniosła w I klasie wieku – 89,65 kg, II klasie – 120,29 kg, a w III klasie – 136,62 kg. Masa poroża w poszczególnych klasach wiekowych wynosiła odpowiednio: 1,66 kg, 3,55 kg i 5,90 kg.

Słowa kluczowe: jeleń szlachetny, masa tuszy, masa poroża, forma poroża

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