ANALYSIS OF TROPHY PARAMETERS IN FALLOW DEER (*DAMA DAMA*) IN HUNGARY, 1998-2016

IMRE KOVÁCS, GERGELY SCHALLY, SÁNDOR CSÁNYI

Szent István University, Institute for Wildlife Conservation
H-2100 Gödöllő, Páter K. str. 1.
Imre.Kovacs@hallgato.szie.hu

ABSTRACT

The assessment of the trophy quality in Fallow deer (*Dama dama*) is often based on the measured values of the individuals with the largest antlers. However, there is little knowledge about the reliability and representativity of this approach.

In our study, we analysed the trend of the annual number of evaluated trophies between 1998 and 2016, the age distribution of the harvested bucks, and the temporal variation in the values of trophy weight and antler length during the study period on the population level and in the case of the best quality antlers. The data were examined in 3 estimated age classes (young: up to 4 yrs, middle-aged: 5-9 yrs, old: from 10 yrs). The groups (year × age class) were characterized by the median, while the largest values were picked in each group by selecting the lowest value among the individuals belonging to the upper 1%, 5% and 10% of the sample size.

The annual number of the presented trophies increased from 894 to 3,795 with an exponential trend. The proportion of the age classes changed significantly. The proportion of the young bucks increased by 10.2%, while the proportion of the middle-aged individuals decreased by 9.9%.

The median of the weight showed no trend in the complete dataset. In the young age class, it increased until 2006, then decreased until 2016. In case of the middle-aged and old individuals, the median and the strongest values at each threshold also increased. The median of the complete dataset, as well as the middle-aged and old bucks, stagnated in the case of antler length. It showed an 8.5 cm decrease between 2007 and 2016 in the young age class. In general, the difference between the group median and the largest values showed the highest variability in case of the 1% threshold. We found a strong correlation between the group median and the strongest values only in two cases (Top 10% and 5% threshold, trophy weight of middle-aged bucks).

Our results suggest that in Fallow deer, the assessment of the trophy quality based on only the largest antlers may be misleading in several cases, especially in the young age class or if the complete dataset is treated as one group. However, the trend of the largest trophy weight in the middle-aged and old age classes may refer to the trend of the median in the relevant groups.

Keywords: Fallow deer, *Dama dama*, trophy evaluation, antler, Hungary

INTRODUCTION

Fallow deer (*Dama dama*) is an introduced species in the Carpathian Basin, with multiple theories regarding the time of introduction (NAGY, 1985). Nowadays, trophy hunting is considered one of the most important aspects of big game conservation and management, and trophy hunting of Fallow deer provides a remarkable income source for many game managers locally (CSÁNYI AND LEHOCZKI, 2010). Furthermore, specific antler parameters in Cervids can be used as bioindicators of the populations (GRANT, 1979; CLUTTON-BROCK *ET AL.*, 1985; DEMARAIS AND STRICKLAND, 2011). Therefore, it is essential to examine the trends of the antler size and quality in the species in question. Assessment of the trophy quality is often based on the measured values of the individuals with the strongest (e.g., heaviest, longest) antlers. However, there is little knowledge about the reliability and representativity of this approach.

In the present study, we used the weight (24 hrs weight) of the Fallow deer trophies and the antler length (mean of main beam length on the two sides of the antlers), as these had been measured on each buck, regardless of being a medal candidate or not. We have analysed

the trend of the annual number of evaluated trophies between 1998 and 2016. We have examined also the age distribution of the harvested bucks and the temporal variation in the values of trophy weight and main beam length during the study period on the population level and in the case of the shot bucks with the best quality antlers.

MATERIAL AND METHOD

In Hungary, it is compulsory to present each antler for evaluation and scoring (Act LV., 1996: Act on Game Conservation, Management, and Hunting). The long-term datasets collected by the hunting authority are stored in the National Game Management Database (CSÁNYI ET AL., 2010). The 24 hrs weight is calculated by software used by the hunting authority and refers to a weight that could have been measured on the trophy 24 hours after its preparation (CSÁNYI ET AL., 2006). This calculation makes it possible to compare the measured weights. The main beam length is measured from the lower edge of the coronet, on the outer curve and along the longitudinal axis of the antler, up to the highest point of the closed palm (INTERNATIONAL COUNCIL FOR GAME AND WILDLIFE CONSERVATION, 2014). The weight is decisive regarding the price of the hunt, furthermore, both parameters are included in the trophy evaluation formula of the International Council for Game and Wildlife Conservation (CIC); thus they affect the final score and medal category of the trophies. The age is estimated by the administrators of the hunting authority, based on primarily the thickness and angle of the pedicles, and the tooth wear of the upper jaw.

The trend of the annual number of the evaluated trophies was analysed through Pearson-correlation, and χ^2-test was performed to examine the changes in the estimated age class proportion. The measured values were examined in 3 estimated age classes (young: up to 4 yrs, middle-aged: 5-9 yrs, old: from 10 yrs). As distributions of annual data differed from the normal distribution in most cases (Shapiro-Wilk test), the groups (year × age class) were characterized by the median. The largest values were picked in each group by selecting the lowest value among the individuals belonging to the upper 1%, 5% and 10% of the sample size. The relationship between the group medians and the lowest values among the individuals belonging to the upper portion of the groups was examined with Pearson-correlation.

We used Corel Paradox 11 (Corel Corp.) software and Kutools for Excel (ExtendOffice) for the database operations, and Past 3.14 (HAMMER ET AL., 2001) for the statistical analysis.

RESULTS

The annual number of the presented trophies (n=42,059) increased from 894 to 3,795 with an exponential trend ($\log_{10}$; Pearson-correlation, r=0.97, *P*<0.001). During the study period, the number of the shot Fallow bucks – and therefore the evaluated trophies – approximately quadrupled in each age class. The highest increase rate can be observed in the case of young individuals (*Figure 1*).
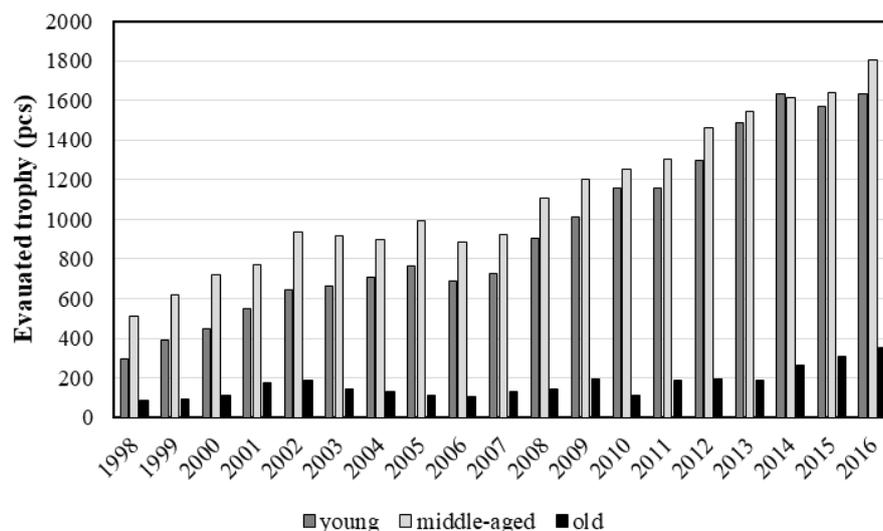
Figure 1. Annual number of the evaluated Fallow deer trophies belonging to each estimated age class in Hungary (1998-2016)

The distribution of the age classes changed significantly (χ^2_{36}=342.25, *P*<0.001). The proportion of the young bucks increased from 32.8% to 43.0%, while the proportion of the middle-aged individuals decreased from 57.5% to 47.6%. Meanwhile, the proportion of the trophies from old Fallow deer varied between 4.7% and 11.7% (started at 9.7% and returned to 9.4%), as shown in *Figure 2*.
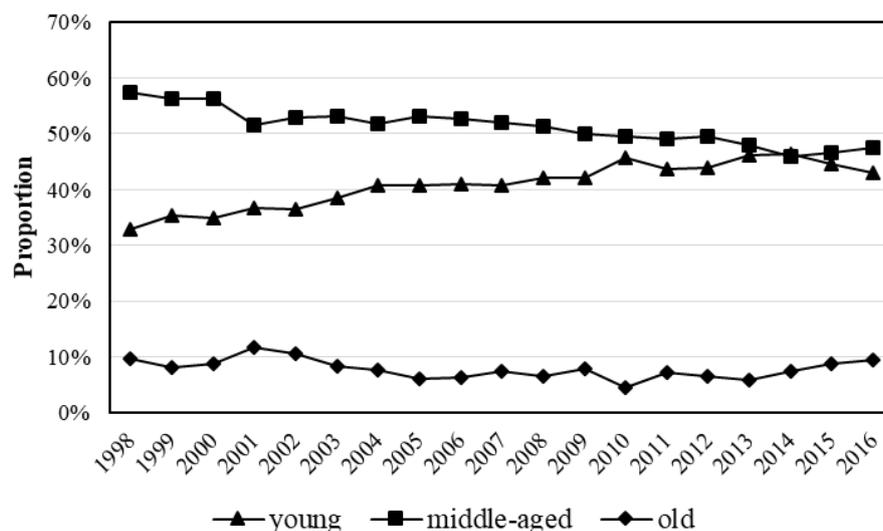
Figure 2. Proportion of the estimated age classes of the Fallow deer trophies (1998-2016)

The median of the weight showed no trend during the study period in the complete dataset (*Figure 3*). In the young age class, this value increased by 0.35 kg until 2006, then decreased by 0.39 kg until 2016. Meanwhile, an increase occurred in case of the middle-aged and old individuals (from 2.9 kg to 3.3 kg and from 3.4 to 4.1, respectively). In these two age classes, the strongest values also increased in case of each threshold: between the data from 1998 and 2016, the largest difference was 1.08 kg (old age class, Top 1%), while the smallest difference was 0.57 kg (middle-aged bucks, Top 5%, and 10%).

The variability in the values of the heaviest antlers was the highest at the Top 1% and the lowest at the Top 10% threshold in each group, as well as in the complete dataset.
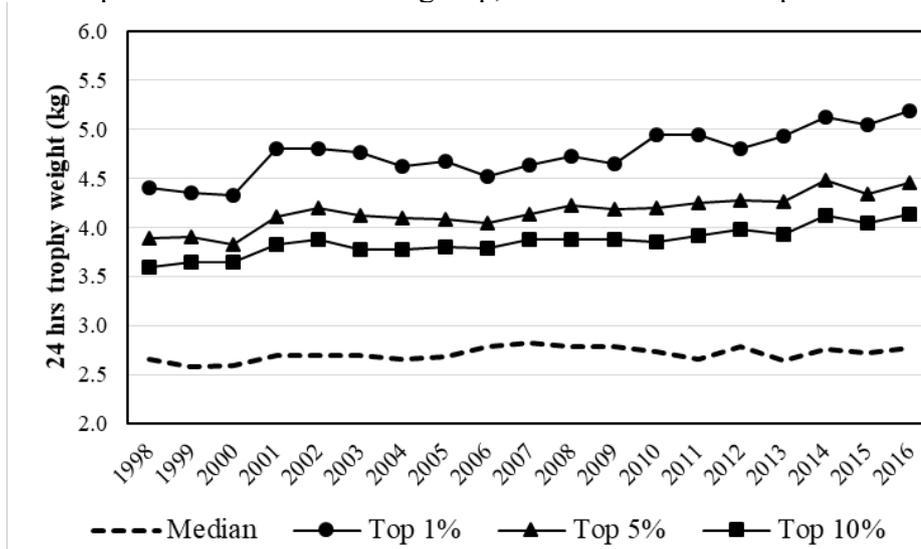
Figure 3. Median and top values of the trophy weight (1998-2016)

Despite the changes in the amount of harvested individuals – with 2.8 cm maximum-minimum difference – the median of the complete dataset proved to be stable in the case of antler length (*Figure 4*). Similarly, the median stagnated also in case of the middle-aged and old bucks. At the same time, the median varied between 35.9 cm and 48.3 cm and showed an 8.5 cm decrease between 2007 and 2016 in the young age class.

The values of the longest antlers showed the highest variability at the Top 1% threshold in each group, as well as in the complete dataset. However, no clear trend can be observed by the best values of the antler length in any group or the complete dataset (*Figure 4*).
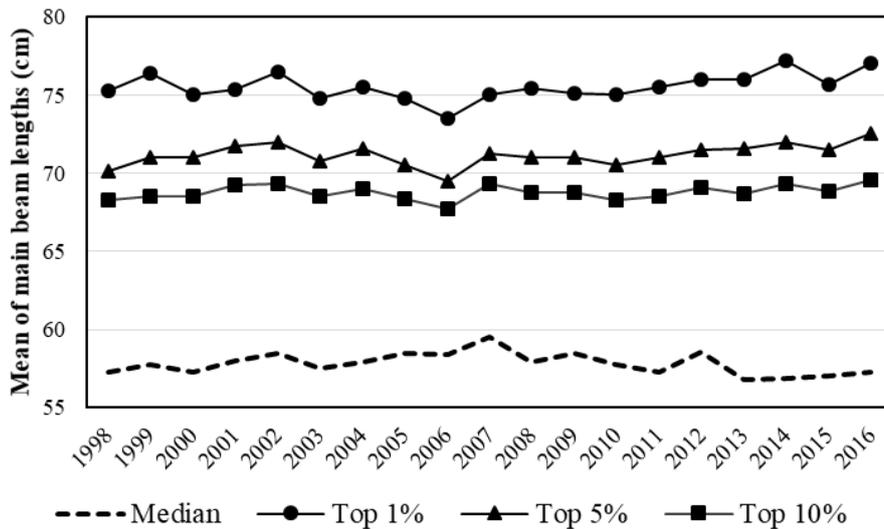
Figure 4. Median and top values of the main beam length (1998-2016)

As represented by *Table 1*, we found a strong correlation between the group median and the lowest value among the individuals belonging to the upper portion of the group only in two cases (Top 10% and 5% threshold, trophy weight of middle-aged bucks). In the case of antler length, no relationship could be found at the Top 1% in any group, furthermore at

any threshold in the complete dataset. At this parameter, the highest R-value was 0.73 (Top 10%, middle-aged bucks).

Table 1. Pearson-correlation between the group median and the lowest value among the individuals belonging to the upper portion of the group (*P<0.05; **P<0.01; ***P<0.001)

Parameter	Group	Top 1%	Top 5%	Top 10%
24 hrs trophy weight	Young	NS	NS	0.51*
	Middle-aged	0.79***	0.94***	0.98***
	Old	0.53*	0.79***	0.82***
	Complete dataset	NS	0.57*	0.59**
Mean of main beam lengths	Young	NS	NS	0.52*
	Middle-aged	NS	0.46*	0.73***
	Old	NS	0.58**	0.52*
	Complete dataset	NS	NS	NS

CONCLUSIONS

In Hungary, the increasing estimated population size of the big game species is typical (CSÁNYI ET AL., 2017), which can be explained mainly by the growth of the forested areas or other suitable habitats (LINNELL AND ZACHOS, 2011). The level of hunting pressure may also affect the population trends (KENWARD AND PUTMAN, 2011), as well as the antler parameters (RIVRUD ET AL., 2013). As the harvest data can be an index of the population trends (FORCHHAMMER ET AL., 1998 and references therein), the two values are connected; consequently, the increasing number of the evaluated Fallow deer trophies (which equals to the hunting bag of the bucks) was expectable.

Due to the changes in the structure and size of the antlers that Cervids develop year by year, – beside the genetic potential and the environment – the age itself affects the antler parameters at some level (DEMARAIS AND STRICKLAND, 2011). Beyond this fact, the result of our analysis on the age distribution also confirmed that the age classes should be treated separately when the trophy quality of the Fallow deer population is assessed.

In Hungary, the species is partially managed in enclosures, which could cause the growth in the best values of the trophy weight. On the other hand, the similar growth in the group median of the middle-aged and old individuals does not support this theory, as only a minor proportion (13.0% in the 2016/2017 hunting year) of the harvested bucks originates from hunting parks (CSÁNYI ET AL., 2017).

According to the legislation of hunting in Hungary, a restriction system protects the young and middle-aged bucks with antlers that meet specific criteria and probably will be able to develop stronger antlers in the following years. The increase in the median and the best values of the trophy weight of the middle-aged and old individuals may indicate the potential efficiency of the management. The decline in weight median of the young age class during the last ten years of the study period may also suggest that the selection of the hunters tends to follow the antler restriction system.

On the other hand, the top values of trophy weight or antler length and the median of the given age class did not follow the same trend and showed no correlation in several cases, which resulted in the variability of the difference between the group median and the largest values. In general, the difference between the group median and the largest values showed the highest variability in case of the 1% threshold.

In summary, our results suggest that in Fallow deer, the assessment of the trophy quality

based on only the largest trophies may be misleading in several cases, especially in the young age class or if the complete dataset is treated as one group. However, the trend of the largest trophy weight in the middle-aged and old age classes may refer to the trend of the median in the relevant groups.

ACKNOWLEDGEMENTS

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