University of West Hungary
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Thesis of PhD Dissertation

Population Ecology of Fallow Deer (*Dama dama, Linnaeus, 1758*) with Special Regard for Birth & Mortality

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Introduction to objectives

The most crucial parts of Act LV 1996 on wildlife management-, protection and hunting and of the connected Annex of the Ministry of Agriculture and Rural Development no. 79/2004 (V.4) are those chapters concerning the acquirement and the real content of initial data necessary for the implementation of prescribed and also professionally very important wildlife management plans. One of the key factors of the implementation of wildlife management plans is the determination of the valid number of the game stock.

We cannot rely without critic on results deriving from methods calculating with high percentage of errors even if they were implemented in the right way, not to speak about the high costs and labor involved. In future planning of quantitative big game management, indirect density indicators, concerning forest management and nature conservation aspects should have pronounced accent. For the implementation of the annual wildlife management plans we need some information to lay the foundation for short-term decisions in order to be able to

determine the annual harvesting guide numbers. On controlling big game population, sex ratio, and age variation, actual birth and mortality data are indispensable, particularly the data referring to progeny to death ratio in cases of high mortality. Due to environmental sensitivity these data can have significant annual fluctuation, so their values should be taken into consideration. Exploring other contributing factors and judging possibilities of improvement may also be important.

Indirect indicators truly demonstrate the tendencies of changes in a population and relying on them an applicable managing strategy can be developed. On planning the annual implementation of quantitative game control, birth ratio indices raised offspring and incidental adult mortality should also be taken into account. Having explored the above factors and determining their correlation and interaction, birth and mortality data could be estimated also by indirect methods.

The author targeted at the improvement of planning fallow deer management when choosing research methods for the achievement of his goal:

- He examined age estimation methods of fallow deer and their accuracy,
- He determined reproduction characteristics and performance of the fallow deer on the his research area,
- He kept following the process of gestation and determined birth and sex ratios of the studied fallow deer population also considering the influencing and contributing factors,
- So as to determine conception dates of the females a function was set up based on using foetal body masses of the fawns,
- He estimated pre- and postnatal mortality rates and tried to find explanation of the reasons.

Applied Methods

To determine changes in body sizes related to the age, after bagging body measures well representing age and body conditions of does and female fawns were taken on site where they could be done easily- such as body length, from nasal tip to tail hilt, shoulder height, and girth size, collar and clean body weight measurements. To estimate body condition of the game he author applied a method, based on KFI. In order to do that kidney and the surrounding fat were collected. To calculate birth ratio, the author counted the foetuses (embryos), found in the culled does uterus on dissection. In cases when culling was done at the beginning of the hunting season and no embryos could be seen due to the early stage of conception, he estimated the number of embryos from the lutea *(corpus lutŧeum*) in the ovary. Lower jaws collected on bagging provided information on age estimation. For judging young animals the primary dentition and its change, while for older specimens molar wear and formation of cement zones were examined. Assessment of raised offspring was

being done all the year round. In the examined fallow deer parcels female specimens and their offspring were counted. Also weather conditions were being taken into consideration in the study area with a precise registry of the most important meteorological data by means of measuring instruments installed in the so called English hut.

Conclusions (theses)

1. The author concluded that the age of the fallow deer population of the studied area could be well determined on the basis of primary and secondary dentitions, tooth wear and number of cement zones. Age estimations conducted in two different ways show a close, statistically validated correlation (R=0,933).

2. As to the author's research, birth ratio was 0,989 in the examined population; frequency of twin-pregnancies was 0,77%. On the research area

conception rate of fallow does was 99% at the same time it was 96% with the female yearlings.

3. The author has set up a basic function on the foetal body mass and the brood fawn body mass. It was applicable for the calculation of the number of days passed from conception date (on the basis of foetal body masses). By means of the above function conception dates of the fallow deer does and female–yearlings on the research area were determined as follows: 1,5% in December, 6,7% in September (late), 14,4% in November while the majority of 77,6% got pregnant in October.

4. Results show a birth sex ratio of 1,08.1 for the examined population. When analyzing annual sex ratio sample collections a t-test was used to select the years showing significant difference from the average. It was found that KFI-s measured during the winter before demonstrated significant (inter) differences ($p_{98/99\text{-}99/00}$=0,000; $p_{98/99\text{-}03/04}$=0,000).

According to the above fact and considering results by the regression analysis it was concluded that kidney fat index and foetal sex ratio correlate to each other. The correlation suggests that index decrease favors to maternal game, pregnant with female offspring and index increase results in higher number of male fawns.

5. Examining foetus growth it was found that in the initial stage of prenatal development the longitudinal growth dominates, followed by a slowing down and a gradual and parallel body weight growth. Having observed time chart of body weight growth and matching it to the author's own function, he found that in the observed period male offspring tended to show more intensive body weight and length growth compared with female ones.

6. It was found that body conditions had changed within rather narrow borders. However, with aging a slight rise followed by a later fall could be

traced. Kidney fat index, showing condition of a specimen, is in close correlation with the eviscerated body weight values (R=0,989). According to the above, the author has stated that owing to the close relation, specimen conditions can be described by eviscerated body weight values, as they are easier to be determined.

7. Analyzing changes in body conditions of the examined animals in the given years, particular influential factors were determined by means of a multivariable regression analysis. Two factors were involved in modeling such as the number of days with snow blanket (coefficient: -0,906) and the allocated forage amount (coefficient: 0,955). Correlation value of the model is R=0,932 significance level of F-test is 0,017.

8. Changes in characteristic body sizes of female fallow deer were related to age. The author separated four age groups: 1 for yearlings, (1 year old) 2 for the young (2-3 years) 3 for the middle-

age category (4-9 years), 4 for the old ones (10 years) Having compared body length measures in the four age groups by statistical methods, it was seen that the body length of yearlings shows a significant difference from the other age groups involved (p_{1-2}=0,001, p_{1-3}=0,001, p_{1-4}=0,004). The same was found when comparing shoulder heights (p_{1-2}=0,032, p_{1-3}=0,003, p_{1-4}=0,003) and collar measures (p_{1-2}=0,021, p_{1-3}=0,007; p_{1-4}=0,15). These results suggest that for the young age period final, characteristic body length, shoulder height and collar sizes of the fallow does have already developed. Comparing girth measures, significant difference could be detected between the younger (yearlings and young) and the older (middle and old) age groups (p_{1-3}=0,005, p_{1-4}=0,003, p_{2-3}=0,033, p_{1-4}=0,098). On the basis of the above, the author concluded that the final, permanent girth size of the fallow deer – contrary to body length, shoulder height and collar size – would develop only after the fourth year.

9. No significant difference was found in body sizes of fallow does, pregnant with male fawns or with female fawns.

10. Examining the number of raised offspring it was found that considerable losses have been caused by winter mortality and by game harvest of the same period. Apart from some exceptions there has been continuous fawn mortality all the year round. Until the beginning of the following breeding season, rate of the offspring raised per a fallow doe was 0, 38.

Publications relevant to thesis

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