University of Sopron

Thesis for the doctor's degree

THE ANALYSIS OF HABITAT USE AND REPRODUCTION BIOLOGY OF WILD BOAR IN ROMANIAN HABITATS

Fodor József-Tamás

Sopron 2017

Graduate school: School of Forestry and Wildlife Management Sciences Roth Gyula

Program: Wildlife management

Supervisor: Dr. Jánoska Ferenc PhD.

1. Introduction and necessity of the research

By analyzing the habitat use and attributes of reproductive biology of a wild animal species we generate basic data for the practical side of wildlife management in the process. With this basic research, which helps the national wildlife management moving forward, the ambition of the author is to move closer those entitled to hunt together with the decision makers to the roots of a more sustainable, more predictable, more programmable wildlife management. In Romania the wild boar populations show an increasing tendency. In consequence there is an expected increasing tendency for the damages caused by these populations, for which there is no established mechanism or financial compensation base at this moment. The irrational protection of the increasing, uncontrolled brown bear population is just worsening the situation. The bear – as we all know - produces similar damages in agriculture as the wild boar, at least in its preferred habitats. The present paper is the first one in the country that analyzes – divided into smaller areas - the use of agricultural lands of wild boar during and after crop ripening periods, offering population dynamical stronghold points for the wildlife managers as a consequence of the reproductive biology analysis. According to the author, the minimal size of the management area should be adapted to the movement area of the targeted species. In Romania due to the lack of tracking researches the space requirements of the fair game species are not known. Basically we hold in our hands the abstract of a research that was made to fill in this niche, and which was destined to supply with basic data the national wildlife management sector.

2. Theses

The target of the author was the analysis of the movement area and attributes of reproductive biology of the wild boar in Romanian habitats. The basis of this work is the analysis of habitat use of the collared individuals in general, and the analysis of preference of the separate agricultural areas in particular, this latter between the limits of

the offer. In detail the author tried to find answers to the following questions:

1. What is the size of the seasonal movement area in a year?
2. What is the size of the yearly movement area of the wild boar calculated with different methods?
3. What is the size of the monthly movement area of the wild boar calculated with different methods?
4. What are the parameters of movement activity of individuals in the puffer zone of forests?
5. In what ratio are the agricultural areas used by the individuals in these puffer zones? Which are the preferred agricultural cultures?
6. Is there any link or cause effect relation between the wild boars staying in particular agricultural areas and the distance of the daytime resting place of the animals?
7. Is there any link or cause effect relation between the size of the particular agricultural areas and the intensity of use by the individuals?
8. Is there a cause effect relation between the monthly use of the agricultural areas and the monthly movement area?
9. What can be the reason of habituation?
10. Effect of drive hunting method on daily movement of individuals.

The analysis of attributes of reproductive biology tried to find answers to the following questions:

1. What are the characteristics of the physical condition of sows coming from the two different types of habitats?
2. What are the characteristics of the conception ratio of sows coming from the two different types of habitats?
3. What observations can we make regarding the number of corpus luteum and fetuses related to the particular sows coming from the two different habitats?
4. What is the relation between the age of the sow, corpus luteum and number of fetuses?

5. Is there any difference between the fetal mortality ratios in case of sows coming from the two different habitats?
6. What characterizes the number of born piglets per one sow for the two different type of habitats?

3. Material and method

3.1. The methodology of movement area analysis

The author fitted 5 wild boars with GPS collars for the analysis of movement area and activity. 2 wild boars were captured and monitored in mountain area, 3 in flatlands. For processing the reproductive biology data the author used the data of the calendar year 2014. Altogether this represents a number of 167 samples.

For the research of the moving area and habitat use we used the GPS Plus collars, version number 10.0.5.12279, made by Vectronic Aerospace GmbH.For the analysis of the seasonal and general movement area the author used the Minimum Convex Polygon method (MCP; Mohr 1947) and the Kernel Home Range (KHR) (Worton 1989) method.

To define the habitat preference the author opted for the most recognized methods in wildlife biology research: the Ivlev index (Ivlev 1961) and Jacobs index (Jacobs 1974). To define the preference of the agricultural cultures, the author used the Ivlev index.

For the definition of the percental offer of agricultural culture of the given habitat, the author calculated first the movement area of the given individual with the MCP method. He calculated and categorized the total area of the agricultural lands of the given habitat, correlated to the total area of habitats and expressed as a percentage.

The author analyzed the use of agricultural areas in relation to yearly and seasonal periods. First the author analyzed the general habitat use with the Corinne Landcover method, than made the analysis regarding the use of the specific agricultural cultures. From the attribute table of the ArcGis/ArcMet application the author selected the GPS points and projecting them to the thematic map of the Payment Agency, appeared

the cultures in which the collared individual moved in the given period. The author made further analysis in Excel and SPSS.

3.2. The methodology of reproduction biology analysis

For the comparison of reproductive biology the author analyzed the fertility rate, the conception rate, number of foetuses, natality rate, and the birth rate. In the same time the author analyzed the reproductive coefficients in relation with age and physical condition, due to the fact that there can be major differences in the particular age groups (Faragó and Náhlik 1997). Therefore during the hunting season, in the period of 1 June and 31 January, and in the crop damages protection period during the summer we collected the following organs from the shot female individuals: uterus, ovary, kidney, kidney fat, lower jaw.
For the age estimation the author made cement layer counting with Aitken method (1975), for the determination of the physical condition the author made kidney fat index calculation with Caughley and Sinclair method (1994), in the view of embryonic and corpus luteum counting the author made the megascopic analysis of the whole reproductive system. Further on the author estimated the fertility rate, fetus number, losses inside the uterus, natality number, post natal sex ratio, the time of conception and birth.

3.3. Applied statistical methods

The author used correlation and regression calculus to compare the monthly and seasonal relatedness of moving areas calculated with different methods, and the size of the moving areas calculated with different methods, the seasonal daily average movement and the moving areas, further on the age of the sow and corpus luteum, and number of fetuses.
The author used non parametric Spearman correlation calculus for the analysis of the relation between the size of the average area, the distance of the agricultural land and the frequency of the points.
The author applied one component variance analysis (ANOVA) for the comparison of the following values: the activity in different periods of

the day, the average distance per hour during a month of the specific individuals, the age dispersion of the samples coming from the two different habitats, the average values of the kidney fat indexes, the average values of the embryonic mortality related to the two different habitats, the average number of fetuses inside and outside the 15 January – 15 February period, the average value of the weight of fetuses according to sex. The author used paired T-probe for the sex ratio comparison of fetuses originating from the two different habitats. He used two sample T-probe for the average corpus luteum and fetus number comparison of the sows originating from the two different habitats. The comparison of the conception rate in different habitats was done with the Kruskal-Wallis test which is based on non-parametric ranks. All statistical analysis was done on α=0,05 significance level.

4. Results

4.1.Results of moving area

1.

The smallest moving areas measured during the whole period of the analysis are between 29 and 753 Ha. In case of the young bores collared in flatlands the smallest moving areas were recorded in April. The assumption was that the smaller moving area of female individuals during spring and early summer are due to births and piglet breeding. The changing pattern of the moving area is identical for both sexes. So the reduced habitat use is not solely due to parental care. For both collared individuals the daylight activity during April is above the yearly average, while the night activity is below it. There is no satisfactory explanation for the reduction of the night activity and increasing of the daytime activity. The analysis of the smallest moving areas shows that during summer small moving areas are typical for the individual collared in flatland and the boar collared in mountain area. This can be explained objectively by the abundance of food supplies. In case of those adult individuals from which we could collect data during winter time (11702AF1 and 11701AM2) the minimal moving areas were recorded in December. For these individuals the daytime and

nighttime activities are below the yearly average. It is most probable that these individuals were trying to minimize their energy losses, and they retreated to a more tranquil zone of the habitat, where they could continuously find supplementary forages. These are the forest areas of the habitat.

2.

The yearly moving area of the wild boar calculated by MCP method varied between 1077,64 and 4012,80 Ha. The measured KHR90% yearly moving area varied between 119,58 and 1445,89 Ha. These values are bigger than the values measured in other European researches, but do not motivate the necessity of a minimally 10000Ha hunting ground.

3.

During the whole tracking period, with the exception of the data received in the month of the captures, the biggest monthly moving area calculated with MKP method varied between 625 and 1950 Ha. In case of the young boars collared in flatlands the maximal moving areas were measured in January, March and December. In case of the male boar also collared in flatlands (11701AM1) the maximal moving area was registered in November. The adult male boar in November regularly covered an even bigger area than in October and December. This could be in close connection with the heat period. In case of the male boar collared in the mountain area (11699AM1) the maximal moving area was recorded in May. In case of the sow collared in the mountain area (11702AF1) the maximal moving areas were recorded in January and August.

4.

The area of the forests in the studied habitats varied between 675,4 and 1017,2 Ha. Considering all the registered positions, the use of forests varied between 87,6 and 32,9%. As a conclusion we can say that the smaller the forest area, the more intensively the wild boars used it. However the use of bands around the forests does not change, it is valid for each collared individual the intensive use of a 100-250m band near the forest. The zone between 250-500m near the forest was used more intensively mainly by the older male boars. The presumption that the

movement activity is more intense near the forests regardless to the habitat was not confirmed.

5.

Separating the agricultural zones and analyzing them in the perspective of movement activity, we cannot unambiguously state that the agricultural zones closest to forests are the most endangered areas regarding wild boar damage. This statement is valid only in case the individual has a limited number of options and it is forced to do with only one or two types of crop. In this case the use of the given agricultural culture increases, it becomes compulsive-forage causing significant damage to the owner of the land. In case the individual can choose near the forest from a number of different options the use of areas is split between the different cultures, selective behavior takes effect in favor of the most preferred forage.

6.

Following the performed tests we can state that there is a close connection in every case between the minimal distance of the parcel from the daytime resting area and the intensity of movement in the given parcel. This close connection is significant too in two cases, on p=0,001 significance level. Knowing these results we can state that the basic hypothesis, that there is a close connection between the minimal distance of the parcel and the intensity of movement, is justified. The direction of the relation is negative in every case, which allows us to draw the conclusion that the closer the culture the more intensive the movement inside it.

7.

The statistical tests show that there is no correlation between the size of the agricultural areas and the intensity of movement inside them, thus the size of the agricultural area is not important in the perspective of wild boar damage.

8.

Both wildlife managers and farmers are interested in the relation between the monthly movement area of the wild boar and the offer of agricultural crops. We can talk about seasonal offer because the agricultural lands can offer a base of interest only in determined periods

of the year. The author cannot find any statistical relation between these variables. In case of some exemplars the monthly movement area seems to be determined by agricultural offer and in other cases contrary. However in period off agricultural crop ripening, the relation`s is insignificant and not to strong.

9.

The released exemplars were captured partially in the wild, partially inside of a game reserve. Interesting is that only the exemplar which is borne in game reserve shown a strong tendency to habituation. Practicly, about 50% of fixes was located inside of village and they 200 m buffer zone. The author suggest that in future the related researches has to be focused also on genethical analysis of habituated exemplars.

10.

According to hunting method`s effect on daily movement range, the author state, that this method affect really the dispersions of wild boars. The strong negative effect can be temperate with intelligent scheduling of drives(max.2/month), good supplementary feeding and the ideal habitat composition. On the other hand, the conditions of high hilly wildlife management units rarely allow the intelligent management showed before.(lack of supplementary feeding because of brown bears, overscheduled drive hunts).

4.2. Reproduction biology results

1.

The average physical condition derived from the kidney fat index of sows originating from the flatland habitats are significantly better than of the sows from mountain habitats (ANOVA: df=140;F=5,243; p=0,0235).

2.

There is no difference in conception rate between the two types of habitats. We registered 87,5% conception rate in the mountain habitat and 88,6% in the flatlands. The p-value of the statistical probe is 0,9870. So the conception rate of the wild boars in both analyzed habitats is around 88%.

3.

In the mountain habitat the number of corpus luteum is greater in average, 8,56 (n=98) than in the flatland habitat 7,53 (n=43).The value of the probe statistics on $\alpha=0,05$ is $p=0,0056$, so the greater value of corpus luteum in mountain habitat differs significantly from the corpus luteum counted in flatland habitat. The number of fetuses in mountain area is 6,69 (n=66) and in flatland area 6,72 (n=39). The statistic value of the T-probe on $\alpha=0,05$ is $p=0,9335$. In conclusion there is no significant difference between the values measured in the two different habitat types.

4.

In both habitat types there is positive significant relation between the age of the sow and the number of corpus luteum. The correlational values are relatively small (r=0,56 in mountain area, and r=0,47 in flatlands) but the p values of the statistical probe are strongly significant on $\alpha=0,05$ level: $p<0,001$, and $p=0,0015$. The number of fetuses in correlation with the age of the sow had the same evolution as experienced in case of the corpus luteum. In case of mountain area samples the correlational coefficient r=0,65, while in flatlands r=0,56. The p values of the statistical probe in both habitats are $p<0,001$.

5.

The mortality related to the total number of samples is 19,45% (n=66) in mountain area, while in flatlands 10,39% (n=39). The result of the comparison shows that the average value of fetus mortality in the two different habitats is significant on $\alpha=0,05$ level (ANOVA: df=104; F=6,5522; p=0,0119). Thus the fetus mortality rate in mountain area is significantly bigger than in the flatland areas.

6.

Due to the fact that there is no statistically significant difference between the average number of fetuses originating from sows shot during 15 January and 15 February and sows shot outside the mentioned period neither in mountain area (ANOVA: df=65; F=3,1094; p=0,0826) nor in flatlands (ANOVA: df=38; F=0,9308; p=0,3409), the average number of fetuses per sow calculated for the total period of the analysis is equal to the number of born piglets per sow. Thus the

number of born piglets per sow in mountain area is 6,69 (n=66) and in flatland 6,72 (n=39).

5. Applications

The results of the present dissertation can be used in the field of agriculture and wildlife management. The complex and delicate issues around the occurrence, existence, resolution and compensation of wildlife damages are in a very basic and primordial stage in Romania. The data drawn from the movement area research can be taken as basic data for establishing the size of hunting areas; the preference of the agricultural crops near the forest areas, the distance of the crops from the forests can serve as a set of basic data to establish a danger zone which could help in the compensation of wildlife damages.

6. Relevant scientific activity of the author

Fodor J.T.: Aspecte ale utilizării gardurilor electrice în gradini zoologice: Conferinţa naţională FGZAR, 2009, Timişoara

Fodor J.T.: „A zárttéri vadtenyésztés aktuális problémái Romániában”(2010) Msc. thesis.

Fodor J.T.: „ Activitatea periodică şi particularităţile de biologie a reproducţiei la mistreţ(Sus Scrofa, L.) pe un habitat din România”(întroducere în cercetare) Revista Hubertus, nr.4, iul-aug,(2010) pag:30-33.

FODOR József-Tamás, JÁNOSKA Ferenc, FARKAS Attila
„A Vaddisznó mozgáskörzetének összehasonlító vizsgálata különböző romániai élőhelyeken(Részeredmények), Kari konferencia, Sopron,2014

FODOR József-Tamás, JÁNOSKA Ferenc, FARKAS Attila
The comparative analysis of the habitat use of wild boar in different

Romanian habitats (Partial results).Scientific Symposium 2014,oct. Univ. Transylvania Brașov

FODOR József-Tamás, A vadkárok mechanizmusa, XII. Konferencia Erdélyi Múzeum Egyesület Agrártudományi Szakosztály, Az erdélyi agrárium-kihívások és lehetőségek a harmadik évezred küszöbén, Sepsiszentgyörgy,2016.november 19.

Scientific book`s:

Mesterséges vadtenyésztés I-II: Oktatási és Szakképzési Kollégium 4142/2008. sz. pályázat

Takarmányozástan: Oktatási és Szakképzési Kollégium 4142/2008. sz. Pályázat

Lecturer activity – wildlife management at:

L.A.M. ILYEFALVA – game keepers – 2010-present

Pannon University,
Kaposvár
Odorheiu - Secuiesc – Vildlife management – 2016-present