

# The connection between climate conditions and population size of most represented large game in a hunting area in Eastern Croatia in period 2008 - 2018

Mirna Gavran<sup>1</sup>, Božidarka Marković<sup>2</sup>, Dragan Dokić<sup>3</sup>, Vesna Gantner<sup>1</sup>

<sup>1</sup>Faculty of Agrobiotechnical Sciences Osijek, University of Josip Juraj Strossmayer in Osijek, Osijek, Croatia

<sup>2</sup>Biotechnical Faculty, University of Montenegro; bozidarkam@ucg.ac.me

<sup>3</sup>Općina Erdut, Bana Josipa Jelačića 4, Dalj, Croatia

\*Correspondence: mgavran@fazos.hr

## Introduction

Red deer, roe deer and wild boar belong to the group of large game and are the most represented species of game in the hunting area in Eastern Croatia. Ambient temperature is an important factor for the body temperature of animals which restricts their spreading to the biosphere. Furthermore, the temperature notably affects the metabolism of wildlife. The importance of extreme temperatures on game health is obvious: severe colds cause diseases of the organs of the urogenital system (kidneys, bladder and sex organs) and digestive organs. The reason for these diseases may be the utilization of frozen food in the hunting ground. On the contrary, the great heats may have the impact of the drought that reveals itself in the loss of vegetation, drainage of smaller water areas of bar and river tributaries. Snow represents an indirect threat to the wild game. The snow covers the ground and the flora and in this way limits the game from consuming food and makes it difficult to move. The hunting ground composes a natural complex of 9364 hectares, it is located in Eastern Croatia, and the same populations of wildlife game live in the entire area. Given the fact that populations of red deer, roe deer, and wild boar have great significance in Croatia, this study aimed to determine the relationship between population size of most represented large game and climate conditions in hunting ground in Eastern Croatia during the analyzed period from the year 2008 to the year 2018.

## Material and methods

The study was conducted in the area of Kućanci, Osijek-Baranja County. The Gavran d.o.o. company became a concessionaire of the Kapelački lug hunting area and has been managing 5738 hectares of the hunting area. The contiguous Đurđenica hunting area of 3626 hectares is managed by the Prkos d.o.o. company, which is a subsidiary company of Gavran d.o.o. and has a business co-operation contract with it, performing sales services of commercial hunting in that hunting area. These two hunting areas form a natural entity of 9364 hectares and the same deer game population resides throughout the area. In the network of meteorological stations, the organization of measurements and monitoring of the climatic phenomena are being conducted. Meteorological stations are organizational units of meteorological services which have the job of conducting meteorological perceptions (measurement and monitoring) according to the founded unique criteria. Observation is being considered as a visual rating of a certain size, while the measurement relates either to the registration of the appropriate type of instrument or to the reading of the instrument value. Comprehending that meteorological factor is commonly important due to the formation of fog, cloud, rain, roses, frosts, and other hydrometeors depend on the amount of moisture in the air. In this paper, monthly precipitation sums, mean temperatures and average humidity were collected for the respective region and periods. Data were given by Croatian Meteorological and Hydrological Service. Company Gavran d.o.o. is the owner of the data analyzed in the article and the hunting staff of the company made the investigation.

## Results and discussion

During the analyzed period from the year 2008 by the year 2018 the mean yearly air temperature varied in intervals from 11 – 13°C, and the mean yearly humidity varied in the interval from 76 – 84 %. The total number of red deer was highest in 2015, when mean air temperature amounted to 12,5°C. During the year 2017, when the mean air temperature amounted to 11°C, the smallest number of males and females was recorded.

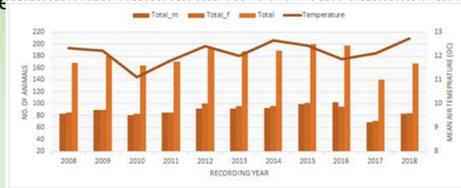


Figure 1. The influence of temperature on the number of a red deer population in the period from 2008 – 2018. (Total\_m - total males; Total\_f - total females)

The mean yearly humidity varied in the interval from 76 – 84 %. The lowest mean humidity was recorded during the year 2012 when the number of females was among higher and amounted to 100 animals. During 2017, when humidity reached 78 %, the smallest number of females and was determined.

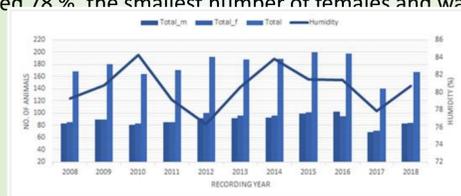


Figure 2. The influence of humidity on the number of a red deer population in the period from 2008 – 2018. (Total\_m - total males; Total\_f - total females)

The highest number of animals, of both gender, males and females, was recorded in year 2009, when mean air was 12°C. During the year 2017 the smallest number of total animals was recorded, only 70 animals. Also, in 2017 the smallest number of males was recorded and totaled 32.

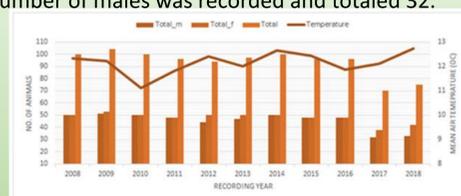


Figure 3. The influence of temperature on the number of a roe deer population in the period from 2008 – 2018. (Total\_m - total males; Total\_f - total females)

The lowest mean humidity was recorded during the year 2012. The highest mean yearly humidity was determined in years 2010 and 2014. The highest number of total animals was recorded in 2009 at humidity 82 % and amounted 104 animals. In year 2017, the lowest number of animals, especially males was recorded. The same situation with the number of animals also occurred in air humidity, which means that the temperature and humidity of the air are closely related when it comes to the number of animals. For example, in 2017 at temperature of 10°C and 73% humidity, the smallest number of males was recorded.

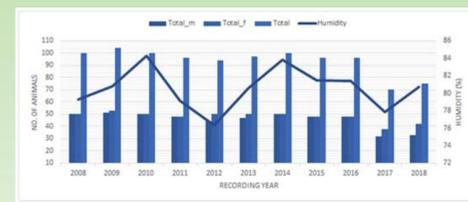


Figure 4. The influence of humidity on the number of a roe deer population in the period from 2008 – 2018. (Total\_m - total males; Total\_f - total females)

The highest number of wild boar was recorded in the year 2013 when the mean air temperature was 12.5°C. During the year 2017 when the mean air temperature amounted to 12°C the smallest number of males was recorded. Furthermore, in the year 2018, the number of animals, males and females, was equal, when the mean year air temperature was higher compared to other years and amounted to 13°C. During the years 2008 and 2014 the mean yearly air temperature was slightly above 12°C.

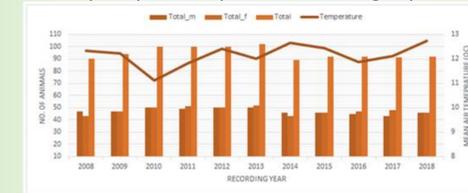


Figure 5. The influence of temperature on the number of a wild boar population in the period from 2008 – 2018. (Total\_m - total males; Total\_f - total females)

The lowest mean humidity was recorded during the year 2012 when an equal number of female and male animals was determined; 50 males and 50 females. The highest mean yearly humidity was determined in the years 2010 and 2014. In the year 2014, the lowest number of female animals was recorded. The biggest total number of animals was recorded in 2013 and totaled 102 animals.



Figure 6. The influence of humidity on the number of a wild boar population in the period from 2008 – 2018. (Total\_m - total males; Total\_f - total females)

The climate conditions are affirmed to be significant elements for the dynamics of the population of different ungulate species. Besides, circumstances of the environment affect the existence of offspring along with the breeding of mature animals. (Geisser and Reyer 2005) Raised rainfall is recognized to cause raised heat loss in ungulates (Barrett, 1981; Parker, 1988), and a solution is to look for refuge if rainfall is heavy (Mysterud and Østbye 1999). Regarding the red deer, the negative correlation with temperature could happen when increased energy needs during the cold weather (Parker and Robbins 1985) force the animals to use additional farmland and as a result reveal themselves to the hunters. One research implied red deer had begun rutting sooner as a consequence of climate change. Until the rutting season, when males battle for a mate and calving was till two weeks earlier on average. The cause of this might be warmer springs and summers. (BBC News, 2011) Accordingly, to Owen-Smith (2010), male survival was more variable than that of females at all stages, from calving to maturity. Adult males appeared more susceptible to extreme density or climate conditions than females. Hotter temperatures had a positive effect on population growth and juvenile survival.

## Conclusion

Based on the conducted research in hunting ground in Eastern Croatia during the period from the year 2008 to the year 2018, the following could be pointed out:

- the mean yearly air temperature varied in the interval from 11 – 13°C,
- the mean yearly humidity varied in the interval from 76 – 84 %,
- the total number of red deer was highest in 2015 when mean air temperature amounted to 12,5°C,
- the highest number of roe deer was recorded in the year 2009, when the mean air temperature was 12°C, humidity 82 % and amounted 104 animals,
- the highest number of wild boar population, males and females, was recorded in the year 2013 when the mean air temperature was 12.5°C and there were 102 animals.

Due to warmer springs and summers, rutting of red deer started earlier and calving was up to two weeks earlier on average. Considering that the offsprings are very susceptible to inadequate environmental conditions primarily low temperatures the drop of wild boar and roe deer population could be expected during the period characterized by extreme environmental conditions. Comprehending the climate effect on behavior is necessary to anticipate the number of new offsprings and to sustain stability in the hunting ground, when coming climate change may bring local weather variables different from the current range.