Scientific Papers. Series D. Animal Science. Vol. LXIII, No. 2, 2020
ISSN 2285-5750; ISSN CD-ROM 2285-5769; ISSN Online 2393-2260; ISSN-L 2285-5750

STUDY ON THE MODELS OF EVOLUTION OF THE AFRICAN SWINE FEVER OF WILD BOARS IN ROMANIA

Alexandru POPESCU, Carmen Georgeta NICOLAE

University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1, Bucharest, Romania

Corresponding author email: popescu.alexandru@ansvsa.ro

Abstract

The study followed for a period of two years the evolution of African swine fever (ASF) in wild boars in Romania in 188 hunting funds from 41 counties. A total of 1471 positive boars were identified with African swine fever, of which 1217 were found dead and 254 were harvested positive by hunting. Several ways of disseminating the disease specific to the Romanian territory have been identified. A specific transboundary diseases crossing also was described. In parallel, the African swine fever dynamics was compared with the classical swine fever in wild boars. From the analysis of the data obtained, two models of the spread of the disease in the wild fauna were identified. Comparing the harvest of the two hunting seasons, a wave movement was observed from east to west of Romania, the number of cases remaining constant.

Key words*: African swine fever, disease spread, wild boar.*

INTRODUCTION

African Swine Fever (ASF) is an epizootic disease with a major impact on the economy, through the significant damage it causes to the livestock sector (EFSA Journal, 2014). The disease is caused by a virus of African origin confined to wild boar or feral pigs populations (Bosch et al., 2017). After the 1970's and 1980's episodes in the Mediterranean basin, a first outbreak was reported in Georgia in 2007 (Gogin et al., 2013), and then the disease spread to the East and Central Europa (Alexander, 2016).

In Romania, due to the conjugation of specific factors: the varied geographical area, the growth of pigs in individual households, as well as atypical weather phenomena, the epizootic covered in a short time the entire territory of the country, creating major problems for pig farms (Bosch et al., 2014).

Pork exports were blocked and production decreased significantly. Wild boars played an important role in the chain of spreading the disease in domestic pigs (De la Torre et al., 2015).

The present paper tried to identify the ways of spreading of ASF (African Swine Fever) in wild boar, the behavioural characteristics of wild boars and an estimate of the future evolution of the disease in wildlife (Bonney et al., 2014; Massei et al., 2015).

MATERIALS AND METHODS

In the summer of 2018, there were multiple ASF outbreaks in wild boars and domestic pigs in the Danube Delta (DW, 2018). Following the explosive dynamics of the disease, hunting associations under the coordination of veterinarians have prepared a program for surveillance and control of the disease (Acevedo et al., 2014). Wild boar collection teams were organized from 188 hunting funds (Boitani et al., 1995). The hunt was done by the method "on the run" during the day, or on the prowl at night, using night vision equipment.

Hunters have been trained on how to safely transport corpses to the carcass collection centres without eviscerating them on the spot - to prevent the virus from spreading in the surrounding environment (Commission Implementing decision (EU) 2019/100, 2019).

At the same time, the detection of wild boar corpses in the respective areas and the collection of long bones were encouraged in order to highlight any viruses in the bone marrow.

ELISA and PCR tests were used in county laboratories to identify ASF virus (Commission Decision 2003/422/EC, 2003; Soto, 2017).

RESULTS AND DISCUSSIONS

Evaluating the data obtained from the 188 hunting funds, an evolution of the disease was found in a wave shape, starting from the south-eastern border of the country and continuing to the west. From the data collected on the field, a significant increase was observed in the number of dead pigs in the Danube Delta starting with July 2018, as a result of massive hunts executed on the Ukrainian shore of the Danube.

The frightened wild boars changed their travel routes and crossed the Chilia Chanel in large numbers, or threw themselves into the sea and drifted along the Black Sea coast. With the dry season, the animals chose to migrate westward along the Danube River, using the left bank of the water, which is below, and form a meadow. In the following weeks the wild boars climbed the tributaries of the river: Siret, Ialomita, Arges, Olt. These rivers with surrounding meadows have provided a very good habitat for animals providing them with moisture and access to food, especially agricultural crops. During this migration, the sick animals came into contact with other local wild boar populations, infecting them as well (Howey et al., 2013). During the winter of 2018-2019, the disease crossed the Carpathian Mountains and appeared in eastern Transylvania. Figure 1 presents the counties of Romania with the number of wild boars found positively for ASF in 2018.

Figure 1. ASF in wild boars in Romania, 2018

The end of January 2019 was characterized by a weather anomaly: the frozen rain. The phenomenon had unusual consequences for the ecosystem. The flower buds of the oaks froze and thus the trees did not bear fruit in 2019, depriving the fauna in the hilly and mountainous areas of an important food: acorns.

As a result, wild boars in search of food descended on the households of the villagers and further spread the disease. Figure 2 presents the counties of Romania with the number of wild boars found positively for ASF in 2019.

Figure 2. ASF in wild boars in Romania, 2019

Unlike (CSF) classical swine fever in which the domestic pig transmits the disease to the wild boar, in the case of ASF the disease is transmitted from wild boar to domestic pig.

This pattern of spreading the ASF was different in the northeastern part of the country where the plague virus also entered from Ukraine, the border being mountainous, forested and difficult to access and advancing from north to south (Bueno et al., 2009).

Following the number of positive cases from the hunted wild boars, especially from the corpses identified in the territory, a decrease in the number of positive cases was observed over time. The situation at the beginning of 2021 shows a disappearance of sick animals or carcasses positive for ASF in the regions where the epizootic was reported three years ago. For example, in the counties of Tulcea and Constanta (Danube Delta) only a few cases were reported, while in the west of the country where in 2018 and 2019 there were 0 cases, currently the disease is evolving.

In the remote mountainous areas the number of animals harvested by hunting was small; instead there was a decrease in the density of wild boars due to high mortality (Figure 3).

Figure 3. Wild boars shooting of different ages

It was gradually concluded that the reduction in the number of wild boars by massive hunting, including during the breeding season, does not give the expected result.

Herds of wild boars have a well-established migration area, the specimens following certain routes that describe ellipses with a radius of 16-20 km and no more.

If the virus has entered a population, it is recommended that the animals be left in place and not be frightened by shooting (even if shock absorbers are used).

Wild boars feel the dead animal and instinctively leave that place migrating and thus spreading the disease.
Particularly in Romania there is an aggravating factor in the spread of the plague virus, due to the increased number of large carnivores: the Carpathian bear. These are the only predators or scavengers that manage to break the long bones of wild boar carcasses (Toïgo et al., 2008).
Knowing that ASF virus is abundant in the blood and bone marrow, through this additional element, the spread of the disease also increases.
Comparing the data on the evolution of classical swine fever in wild boar, a specific dynamic was observed. If the number of animals falls below 0.5% per km2 the disease disappears naturally (Figure 4).

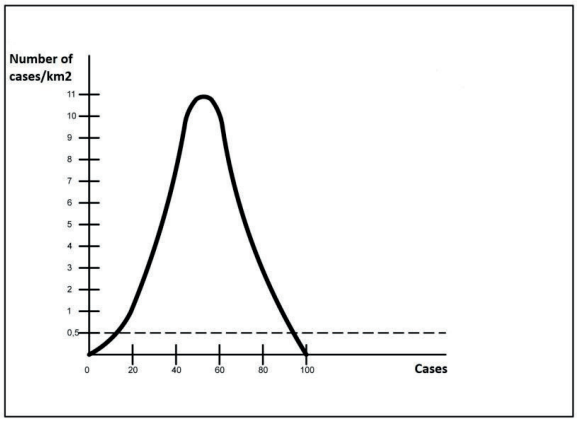

Figure 4. Classical swine fever dynamics in wild boars

In the case of ASF, in the same situation of 0.5% per km2, due to the much longer period of preservation of the virus in the blood and in the bone marrow, the corpses remain a source of contamination for a much longer period of time (up to 9 months) (Figure 5).

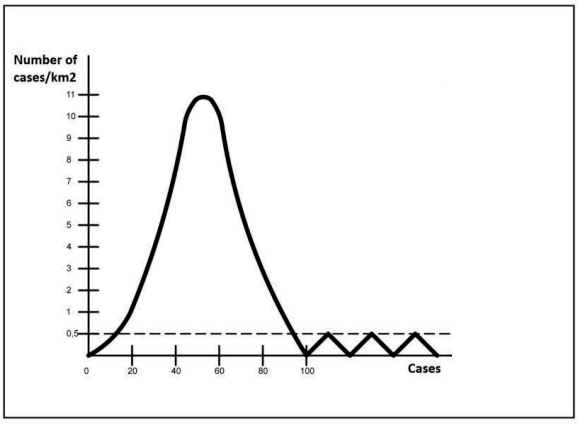

Figure 5. ASF dynamics in wild boars

In this way the virus is transmitted from one year to another, surviving the winter period. If in the case of classical swine fever the elimination of the disease from households decreases the pressure on wild boars, in the case of ASF there is a continuous passage of the virus between domestic pigs and wild boars.
Thus, wild boars infect domestic pigs in various ways: contamination of crops, direct contact with domestic animals, if they are left free, or if shelters are not protected by fences and wild boars are attracted to the smell of sows in heat.
On their turn, domestic pigs can be a source of contamination through carcasses, mismanaged

manure or contaminated by-products. In this way the disease can be maintained in wild boar herds from one year to another.

CONCLUSIONS

It was gradually concluded that the reduction in the number of wild boars by massive hunting, including the breeding season, does not eradicate the African swine fever disease.
If in the case of classical swine fever the elimination of the disease from households decreases the pressure on wild boars. In the case of African swine fever there is a continuous passage of the virus between domestic pigs and wild boars.
Fencing the north-east border, combined with a high surveillance system, may reduce a new wave of African swine fever in Romania.

ACKNOWLEDGEMENTS

This research work was carried out with the support of National Sanitary Veterinary and Food Safety Authority of Romania.

REFERENCES

Acevedo, P., Quirós-Fernández, F., Casal, J., Vicente, J. (2014). Spatial distribution of wild boar population abundance: Basic information for spatial epidemiology and wildlife management. *Ecological Indicators*, 36, 594-600. http://dx.doi.org/10.1016/j.ecolind.2013.09.019

Alexander, Ns., Massei, G., Wint, W., (2016). The European distribution of Sus scrofa. Model outputs from the project described within the poster –Where are all the boars? An attempt to gain a continental perspective. *Open Health Data*, 4(1), 1-6.

Boitani, L., Trapanese, P., Mattei, L. (1995). Methods of population estimates of a hunted wild boar (Sus scrofa L.) population in Tuscany (Italy). *IBEX J. Mt. Ecol.*, 3, 204-208.

Bonney, R., Shirk, J. L., Phillips, T. B., Wiggins, A., Ballard, H. L., Miller-Rushing, A. J., Parrish, J. K., (2014). Next Steps for Citizen Science. *Science*, 343, 1436-1437.

Bosch, J., de la Torre, A., Alexandrov, T., Iglesias, I., Miteva, A., Muñoz, M. J. (2014). Can habitat suitability predict the presence of wild boar? Suitable land uses vs. georeferenced data in Bulgaria. *Folia Zoologica*, 63 (3), 194-205.

Bosch, J., Iglesias, I., Munoz, M. J., Sanchez-Vizcaino, J. M., de la Torre, A. (2017). Update on the risk of introduction of African Swine Fever by Wild Boar, into disease-free European Union countries. *Transbound. Emerg. Dis*., 64(5), 1424-1432, 10.

Bueno, C. G., Alados, C. L., Gómez-García, D., Barrio, I. C., García-Gonzáles, R. (2009). Understanding the main factors in the extent and distribution of wild boar rooting on alpine grasslands. *Journal of Zoology*, 279, 195-202.

Commission Decision 2003/422/EC of 26 May 2003 approving an African swine fever diagnostic manual (2003). Retrieved November 25, 2019, from https://eur-lex.europa.eu.

Commission Implementing decision (EU) 2019/100 of 22 January 2019 amending the Annex to Implementing Decision 2014/709/EU concerning animal health control measures relating to African swine fever in certain Member States. Retrieved November 25, 2019, from https://op.europa.eu/en/ publication-detail/-/publication/0fe930c8-1ee7-11e9-8d04-01aa75ed71a1

De la Torre, A., Bosch, J., Iglesias, I., Munoz, M. J., Mur, L., Martinez Lopez, B., Martinez, M., Sanchez-Vizcaino, J. M. (2015). Assesing the risc of African Swine Fewer Introduction into the European Union by Wild Boar. *Transbound. Emerg. Dis.*, 62(3), 272-279, 6.

EFSA Panel on Animal Health and Welfare (AHAW) (2014). Scientific Opinion on African swine fever. *EFSA Journal*; 12(4), 3628. Retrieved November 12, 2019, from https://efsa.onlinelibrary.wiley.com/doi/abs/10.2903/j.efsa.2014.3628.

Gogin, A., Gerasimov, V.; Malogolovkin, A.; Kolbasov, D. (2013). African swine fever in the North Caucasus region and the Russian Federation in years 2007–2012. *Virus Research*, 173(1), 198-203.

Howey, E. B., O'Donnell, V., de Carvalho Ferreira, H. C., Borca, M. V., Arzt, J. (2013). Pathogenesis of highly virulent African swine fever virus in domestic pigs exposed via intraoropharyngeal, intranasopharyngeal, and intramuscular inoculation, and by direct contact with infected pigs. *Virus Research*, 178(2), 328-339.

Massei, G, Kindberg, J., Licoppe, A., Gačić, D., Šprem, N., Kamler, J., Baubet, E., Hohmann, U., Monaco, A., Ozoliņš, J., Cellina, S., Podgórski, T., Fonseca, C., Markov, N., Pokorny, B., Rosell, C., Náhlik, A. (2015). Wild boar populations up, numbers of hunters down? A review of trends and implications for Europe. *Pest Management Science*, 71(4), 492-500.

Deutche Welle (2018). Romania battles African swine fever outbreak, DW, 29 August 2018. Retrieved October 29, 2019, from https://www.dw.com/en/romania-battles-african-swine-fever-outbreak/a-45285083

Soto, P. C. (2017). Priority diseases in Europe, including transparency aspects. Retrieved December 12, 2019, from http://web.oie.int/rr-europe/eng/regprog/docs/RSC7%20(Brussels,%20Oct%202017)/GFTADs%20Europe%20_SC7_WAHIAD_2017_final.pdf.

Toïgo, C., Servanty, S., Gaillard, J. M., Brandt, S., Baubet, E. (2008). Disentangling natural from hunting mortality in an intensively hunted wild boar population. *Journal of Wildlife Management*, 72(7), 1532-1539.

.