12th International Symposium on Wild Boar and Other Suids

BOOK OF ABSTRACTS

Editors: Jakub Drimaj & Jiří Kamler

4th – 7th September 2018, Lázně Bělohrad
Czech Republic

MENDEL UNIVERSITY IN BRNO

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Department of Forest Protection and Wildlife Management
Faculty of Forestry and Wood Technology
Mendel University in Brno

12th International Symposium on Wild Boar and Other Suids

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The symposium is organized under the auspices

of Danuše Nerudová, the Rector of the Mendel University in Brno,
of Libor Jankovský, the Dean of the Faculty of Forestry and Wood Technology,
of Miroslav Toman, Minister of the Agriculture,

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Radim Plhal

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SATURDAY, Sep 8th   Post-Conference Tour

Introductory word of the Minister of Agriculture of the Czech Republic

Dear ladies and gentlemen,

Allow me to use this opportunity to welcome you to the 12th International Symposium on Wild Boar and Other Suids.

Wild boar has become probably one of the most discussed animal species not only in the Czech Republic, but at the moment also in the whole Europe.

Numbers of the culled wild boar are increasing every year; therefore, the approach to the hunting of this species is also changing as it is performed mainly at night with the use of the rapidly developing technologies of night vision and thermal imaging. Hunting with the assistance of dogs has changed as well. Stronger and more sturdy dog breeds are being used together with modern systems like GPS. Very effective trapping devices supported by the state are also being employed more and more frequently.

High population numbers of any kind of species are associated with problems, especially with diseases. Europe is currently battling African swine fever that has been spreading not only in the population of wild boar, but also among domestic pigs, probably due to human activity. In free-living wild boar, its role as a population control mechanism is understandable. However, in case of transmission of the infection to domestic livestock, the economy of the individual states is strongly affected. Such situation forces us to react and to strive for eradication of this infection.

Ministry of Agriculture in cooperation with the State Veterinary Administration take steps in order to prevent the spread of the African swine fever. The two most important factors are fast retrieval of the dead individuals followed by their immediate sanitation and maximal reduction of the wild boar population in the Czech Republic. We are applying mainly the motivation tools such as awarding exemptions from the forbidden hunting methods, subsidising of trapping devices, extending the hunting period limits and payment of financial rewards for every culled wild boar. And it needs to be said that wild boar shooting by the police of the Czech Republic has significantly contributed to solution of the situation in the affected area.

The African swine fever has clearly shown that high population density, not only of wild boar, may pose a risk of very negative consequences, especially for farm animal husbandry. So far, the Czech Republic is the only European country that has succeeded to keep the outbreak within a closed infested area and to prevent its importation to domestic livestock.

Yours sincerely

Miroslav Toman
Minister of Agriculture

MINISTERSTVO ZEMĚDĚLSTVÍ

TRANSFORMING COLLECTIVE HUNT DATA FOR ESTIMATING WILD BOAR (*SUS SCROFA*) POPULATION DENSITY IN NORTH-WESTERN POLAND

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Abstract: In November and December 2017 in 12 hunting districts managed by Susz Forest District took place 21 collective hunts. During this hunts were 121 hunting plots in which were harvested 79 wild boars. The total study area covered 770.2 km^2 from which the forest area was 234.1 km^2. The calculated harvest success index, i.e. number of harvested wild boars per one hunting plot amounted 0.657. For calculating of wild boar population density was used correlation between harvest success index (independent variable) and wild boar population density (dependent variable). Density of wild boar population in study area obtained according this relation was calculated as 70.3 individuals/ 1000 ha forest area, what gives 1645 individuals of wild boars. According to arbitrary guess-estimates of local hunter clubs there are 722 wild boars in the study area. Collective hunts are routinely used in Poland in big game management. Obtained results suggested there is good perspective of using collective hunts to reliable estimation of wild boar population.

FIRST ORAL IMMUNIZATION OF WILD BOAR AGAINST AFRICAN SWINE FEVER VIRUS

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Abstract: African swine fever (ASF) is currently the most significant threat for the European swine industry. Since 2014, ASF has reached to Estonia, Latvia, Lithuania, Poland, Romania, Moldova, Czech Republic and Hungary. The main reasons for this fast spread are related to the high abundance of wild boar (*Sus scrofa*) through Europe, the free and continuous movement of infected-wild boar populations among countries and the lack of vaccines to prevent ASF infection. The main objective of this study is to determine (i) the immunization capacity of an attenuated ASF virus (ASFV) genotype II non-haemadsorbing (non-HAD) isolated in Latvia during 2017 (LV17/WB/RIE1) in wild boar by oral administration, and (ii) its protection against a highly virulent challenge strain. To carry out this objective, we immunized a group of twelve wild boar by oral route with 10^4 TCDI$_{50}$ LV17/WB/RIE1. To evaluate the potential transmission of this attenuated vaccine candidate, three animals were directly exposed by contact. Regarding clinical course, we didn´t find any lesions or skin reaction associated to this attenuated vaccine candidate. Four animals vaccinated and two animals in contact showed mild fever (40-40.8°C), which coincided with the peaks of viremia. Short viremia (4 days) was detected in two vaccinated animals after 21 days post-vaccination (dpv), while two animals in contact showed viremia at 10 days post-contact (dpc). Antibody responses were detected by ELISA test in 66.67% of the vaccinated animals and in 100% of the animals in contact at 15.6 ± 4.2 dpv/dpc. Complementary antibody detection by IPT is ongoing. All animals with detectable viremia developed immune response. Challenge was performed by direct contact with a group of four wild boar inoculated by intramuscular route with 10 TCDI50 of Armenia/07 virus, a highly virulent strain. All vaccinated animals (direct and indirect immunized) plus two more wild boar (used as control challenge) were exposed to this virulent strain since 33 dpv. The results of the challenge infection are in process (40 dpv and 7 days post-challenge) and will be finished before the presentation of this study in the congress. This candidate vaccine is capable of inducing an immune response in wild boar by oral administration. Currently, there is no effective vaccine against ASF tested in wild boar and this experiment represents a considerable progress for the control of the infection in the wild cycle.

WILD BOAR DISTRIBUTION AND HABITAT PREFERENCE IN LITHUANIA

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Keywords: wild boar, distribution, forest, habitat, Lithuania

Abstract: In Lithuania, wild boar attributed to problematic species because of damage caused to agriculture and forestry and due to overabundant population, that becomes a source of contagious diseases. In the critical situation, we have to decide whether a population should be exterminated (actually impossible) or manage it. Under an insufficient control, the population increase further while it stimulates a self-control and spread of diseases. Population control is the feedback strategy under the danger of AFS outbreak determining potential role of species in disease transmission and its repression. Decisions of control measures are impossible without knowledge of animal distribution depending on local natural and anthropogenic conditions. The population size and harvesting in the different climatic sub-districts, continentality and habitat suitability were ascertained by long-term surveys. The wild boar herd indices were determined by the long-term annual mean increment considering offspring susceptibility to diseases and mortality, age-dependent differences in reproduction and long-term survey. Forests were distributed into categories by their parameters and suitability for wild boar: pure pine (A –maritime, B – Southern zones), pine-spruce (C – Eastern and D – Central zones), mixed spruce-deciduous, and deciduous with spruce forests (F – Northern zone). The territorial suitability expressed in points was: 1 – pure pine, 2 – pine-spruce, 3 – mixed spruce-deciduous, and 4 – deciduous with spruce forests. The long-term annual increment of the population was 60% (2-3 in B, 3-4 in A, 3-4 in C, 4-5 in D and 5 in the deciduous with spruce forests while 4-5 in F). In the B (continental dunes, arenosols, podzols), the clumped distribution prevails (δ=6,8). Dependence on the soil fertility decreased (r=0.47) in comparison with long-term one (r=0.73). In C and D (more podzols, less poor forest sites, soil fertility 2.1-2.9), wild boar distributed more randomly (δ=3.4) as in the mixed spruce-deciduous forests (soil fertility r=0.37, t=1.86 less significant). The regional differences withered due to human activities but are still positive. To control population, this parameter need to be considered. Despite population decline implementing ASF measures, the most abundant local populations still are in the deciduous with spruce and mixed spruce-deciduous forests where natural and human conditions are most suitable.

PREVALENCE OF SELECTED EMERGING AND RE-EMERGING PATHOGENS IN POPULATION OF WILD BOAR IN THE CZECH REPUBLIC

Marcel Bena [1,2], **Petra Vašíčková** [2], **Jiří Kamler** [1], **Monika Kubánková** [2], **Jakub Drimaj** [1], **Markéta Hušáková** [2], **Iva Slaná** [2], **Radim Plhal** [1], **Ondřej Mikulka** [1]

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Keywords: Wild boar, Hepatitis E virus, Aujeszky's disease virus, *Trichinella spiralis*, *Toxoplasma gondii*, zoonoses

Abstract: Wild life, especially wild boars, are hosts to a number of pathogenic viruses, bacteria and parasites. More often these pathogens are silent or asymptomatic in their natural hosts. In some instances they can infect other species, and this cross-species transmission might lead to human infection. Several of these viruses, bacteria or parasites are emerging or re-emerging in nature. Present study describes prevalence of such pathogens in wild boar population in the Czech Republic. A total of 361 wild boars were tested for presence of hepatitis E virus, suid herpes virus 1 (Aujeszky's disease virus), *Toxoplasma gondii* and *Trichinella spiralis*. Analysed samples were collected in period of two years (2016 and 2017) and originated from 22 location of the Czech Republic. Detection of selected pathogens was performed by molecular methods (qPCR or RT-qPCR). Hepatitis E virus and Aujeszky's disease virus were found in at least one sample of 54 (15 %) and 13 (4%) animals, respectively. Presence of *Toxoplasma gondii* was detected in samples of 23 (6 %) tested wild boars, while all analysed samples were negative for presence of *Trichinella spiralis*. The prevalence of selected pathogens seems to be low in wild boars, however obtained result should not be underestimated. According to found prevalence of hepatitis E virus (15 %) and an annual wild boar catch in 2016 (over 160,000 animals), 24,000 wild boars could be infected by this virus and thus could serve as source of human infection.

DETERMINATION OF RADIONUCLIDES ^{137}CS A ^{40}K IN WILD BOAR MEAT IN VARIOUS REGIONS OF THE CZECH REPUBLIC

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Keywords: radionuclides ^{137}Cs and ^{40}K, gamma-ray spectrometry, wild boar meat

Abstract: The aim of the study was to investigate the contamination of wild animals by radionuclide ^{137}Cs in various regions of the Czech Republic 30 years after the Chernobyl accident.

Since the ^{137}Cs content in wild boars meat from areas with a higher area contamination (over 13 kBq/m^2) is monitored regularly, attention was focused on areas with a low area contamination (below 1 kBq/m^2) and medium area contamination (2,2 – 5,5 kBq/m^2) immediately after the accident.

The activities of ^{137}Cs and ^{40}K radionuclides were determined by the gamma-ray spectrometric method in 38 samples of wild boar meats. The methodology for the determination of both radionuclides was adapted depending on the different sample sizes of the meat collected. The activities of both radionuclides in individual samples in four different locations are presented, including combined uncertainty of determination. The results of ^{137}Cs activities in wild boars indicate that after such a time the nature of the ecosystem in which wild boars live is more important than the size of the original fall of radionuclide ^{137}Cs in April and May 1986. The concentration of radionuclide ^{40}K is similar for all wild boar and corresponds with the metabolism of this biogenic element.

POPULATION DENSITY AND NUMBER OF WILD BOAR (*SUS SCROFA*) ESTIMATED BY SAMPLING PLOTS IN SOUTH-WESTERN POLAND

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Keywords: population density, sampling plots, wild boar, African swine fever, Poland

Abstract: The objective of the study was to determine the density and population numbers of wild boar in south-western Poland in forests of a total area of 550,300 hectares, administered by the Regional Directorate of State Forests in Wroclaw. The wild boar game management there is conducted in ten large management units whose forested areas range from 39,900 to 68,700 hectares.

In January and February 2017, in all large management units, the taxation exercises of wild boar population numbers were conducted on large (300 – 500 hectares) sampling plots. On those plots, the wild boar were counted by teams numbering 30 – 50 persons. The combined area of all sampling plots amounted to 68,800 hectares, i.e. 12.5% of the forested study area. In particular management units, the density of wild boar individuals ranged from 24.9 individuals / 1000 hectares of forest in large coniferous forest complexes to 96.0 individuals / 1000 hectares of forest in fragmented forests.

The population number of wild boar throughout the study area was estimated at 32,200 individuals, i.e. 58.7 animals / 1000 hectares of forest (19.5 individuals per 1000 hectares of forest and farmland). Because of the epidemic of African swine fever, the guidelines from the Polish government obligate hunters to reduce the population number of wild boar to 5 individuals / 1000 hectares of forest and farmland. That means that the number of wild boar should be reduced to 8,300 individuals in the studied area. Such goal can be achieved in the period of 10 years. Therefore during 2017/18 hunting season about 36000 of wild boar should be harvested.

FERAL SWINE DAMAGE MANAGEMENT IN THE USA: NATIONAL AND STATE PROGRAMS

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Keywords: feral swine, USA

Abstract: Feral swine (*Sus scrofa)* in the USA have increased dramatically in the past decade and are now established in 33 states. As a non-native, invasive species, feral swine damage agriculture, wildlife, natural ecosystems and pose a risk to human health and safety. In 2014, the US Congress appropriated $20M (US) for a national feral swine damage management program to be managed by the US Department of Agriculture-Animal and Plant Health Inspection Service-Wildlife Services (WS) program. The objectives of the program are to manage the damage caused by feral swine through eradication where practical and through damage management removals where populations currently exceed the ability to eradicate in the short term. Damage management activities vary from state to state depending on partnerships, state regulatory laws and swine populations. Research has focused on the development of new or refined tools for management, economic impacts of damage, population modelling and diseases of concern to agricultural interests. A genetic library has been established to provide insight into eradication projects and the origins of new populations. Significant resources have been dedicated to outreach to enhance the effectiveness of the program.

Texas serves as one example of a state damage management program under the national framework. Texas has over 2.5M feral swine distributed widely over the state. The Texas Cooperative WS Program collaborates with the State and private landowners to provide feral swine management on over 2M ha of private and public land. In FY 2017, Texas WS removed 28,123 feral swine and saved landowners over $10M (US) in damage. Texas WS personnel contributed 1942 disease surveillance samples and contributed to 10 different research projects. WS employees conducted 1,690 outreach events directly reaching 14,693 people. Total direct program costs in 2017 were $3.85M (US).

ASSESSING THE ACTIVITY RHYTHMS OF WILD ANIMALS: IMPORTANT INSIGHTS INTO THE OVERALL ECOLOGY OF A SPECIES

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Abstract: Activity rhythms are important in controlling the energy balance of animals: they result from a simultaneous adjustment of the multiple behavioural traits aimed to meet the energy requirements for maintenance, growth and reproduction. As such, studies on activity rhythms may provide useful insights into the overall ecology of a species and help develop effective management strategies. By examining highly detailed activity data collected by means of accelerometers fitted on GPS-collars, we studied wild boar (*Sus scrofa*) daily activity rhythms investigating the effect of environmental conditions and anthropogenic stressors on their diurnal and nocturnal activity. Unlike other ungulate species, the activity pattern of wild boar was not bimodal, but was continuous during the whole night with an acrophase during the first hours of the night. All year round, we reported low activity levels during the day, which opportunistically increased under the most favourable environmental conditions. Activity was found to be significantly affected by such weather conditions as temperature, precipitation and air relative humidity. Moreover, we found that nocturnal activity slightly increased as moonlight increased.

Part of our analysis was focused on investigating how anthropogenic stressors, such as capture and hunting, affect wild boar behaviour. We found a strong reduction of activity and mobility lasting the first 10 post-capture days, with a gradual restoring of normal levels. In popular belief as well as in old literature, wild boars are thought to be diurnal, with a tendency to switch to a nocturnal behavioural pattern when suffering from intense human pressure. Nevertheless, our results suggested that the overall impact of hunting on wild boar activity is non-significant, on both a broad and a finer temporal scale. Consequently, we conjectured that wild boar nocturnal habits are not directly influenced by the current hunting disturbance, though they may have evolved over several decades of hunting harassment. Alternatively, but not exclusively, nocturnal habits may have evolved as a low-cost strategy to achieve an optimum thermal balance (i.e., behavioural thermoregulation).

FIVE YEARS FACING THE CHALLENGE OF URBAN WILD BOAR IN BARCELONA

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Abstract: In May 2013, the Wildlife Ecology & Health group (WEH) of the Universitat Autònoma de Barcelona was appointed by the Barcelona Council to provide consultancy services related to the increasing wild boar-related incidences in the urban area of Barcelona.

Since then, study and management approaches have been developed along five main lines, namely:

1. Reactive capture of individuals causing conflict or potential risk in urban areas
   During this five-year period, the WEH has carried out 235 interventions in the urban area, where 290 wild boar have been captured by teleanaesthesia using a blow-pipe and retired. These captures are not intended to effectively reduced wild boar density or presence in the urban area, but to solve problematic situations.
2. Identification of the factors attracting wild boars to the urban area of Barcelona
   In Barcelona, urban wild boars appear close to streams, which might act as corridors, following a seasonal pattern (March to November). Their presence is more frequent in fragmented neighbourhoods with urban green areas and stray cat food.
3. Measures to reduce food available for wild boars in the urban area of Barcelona
   After identifying the main food sources for urban wild boar in the districts limiting with Collserola, (3a) wild boar proof devices have been provided to stray cat feeders; (3b) waste bins and containers have been protected from wild boars; and (3c) awareness campaigns have been carried out to prevent direct wild boar feeding by humans.
4. Capture of periurban wild boars to decrease the pressure on the city limits
   Twenty-eight planned captures using either collective physical methods (drop-nets) or teleanaesthesia with blow-pipe have been carried out in the proximity of the urban area of Barcelona to capture 150 wild boars.
5. Vegetation clearings in the interface between Barcelona urban area and the contacting natural green areas of the Collserola massif
   In combination with the elimination of periurban wild boars, vegetation clearings in the contact zone between the natural environment of Collserola and the urban area of Barcelona were carried out. These vegetation clearings aimed at preventing non-habituated wild boars to enter the urban area and become used to thrive in the urban environment after retiring those which were already becoming habituated.

URBAN WILD BOARS GROW BIGGER AND FASTER THAN THEIR NON-URBAN COUNTERPARTS

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Abstract: Urbanization is an important threat to biodiversity but some species can thrive in urban environments. However, urban selective pressures may alter the behaviour, morphology and genetic structure of populations. Despite wild boar (*Sus scrofa*) is colonizing urban areas, few studies have analysed wild boar responses to urbanization. Thus, our aim was to describe the effects of urbanization on the wild boar growth curve and first reproduction in a Mediterranean area.

For this purpose, we compared 298 wild boars captured and euthanized for management purposes in the city of Barcelona (BCN) with 127 wild boars hunted in the natural bordering area of Collserola (COLL), in north-eastern Spain. Between 2013 and 2018, we recorded body mass, age, reproductive status of females (pregnant, lactating, neither) and the finding of anthropogenic food in wild boar stomachs. We used generalized additive models (GAM) to compare wild boar body mass/age relationship between areas. Then, we adjusted body mass data to the logistic growth model.

We created two separate growth models due to differences in body mass/age relationship between areas shown by GAM ($p<.001$). According to these models, wild boars reached an asymptote in their growth at 56–62 Kg in BCN and 42–51 Kg in COLL, despite the body mass at birth was similar. The growth rate during the period of maximum growth was 3.9 Kg/month for urban and 2.3 Kg/month for non-urban wild boars. A significantly higher number of BCN wild boars had food from anthropogenic origin in their stomachs (54%, 107/199) when compared to COLL wild boars (3%, 4/117; $p<.001$). Foetus size of pregnant females indicated that first reproduction occurred significantly earlier in BCN (estimated conception at 9-11 months of age, n=6) than in COLL females (14-16 months, n=3; $p<.05$). Exploiting anthropogenic food resources is a behavioural response to urbanization and diet composition could explain the differences in body mass and growth rate between urban and non-urban wild boars. Consequently, growing faster would also lead to an early first reproduction.

Wild boars from an urban area reached larger body mass, grew faster, exploited more anthropogenic food and bred earlier than wild boars from the bordering natural area. These are probably responses to the urban environment within the wild boar natural variability, but further monitoring of urban wild boar populations is needed to eventually distinguish between phenotypic plasticity and genetic adaptation.

LEGAL FEEDING BAN AND ITS CONSEQUENCES ON WILD BOAR DAMAGE IN AGRICULTURE

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Keywords: feeding ban, hunting bag, damage, agriculture

Abstract: In 2011, a new hunting law (Loi du 25 mai 2011 relative à la chasse) was adopted in Luxembourg. One of the novelties was a feeding ban for game species: only the restricted use of specific food items remain allowed for the unique use of baiting. This use was specified in a regulation in 2012 (Règlement grand-ducal du 9 octobre 2012 déterminant les espèces de gibier qui peuvent faire l'objet d'un appâtage ainsi que les conditions et modalités de cet appâtage). Following this regulation, wild boar *Sus scrofa* may be baited with a maximum of one litre of dry cereals or maize, at one baiting station per 50 ha of woodland.
Critics claimed that damage caused by wild boar in agriculture would increase, and that it would become more difficult to hunt wild boar.
A few years after the implementation, first experiences can be shared, as well as the evolution of damage claims in agriculture and of the hunting bags.

RECENT TRENDS IN WILD BOAR-VEHICLE COLLISIONS IN SPAIN

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Keywords: animal-vehicle collisions, Spain, human injuries, trends

Abstract: Wild boar-vehicle collisions (WBVC) are a relevant problem of growing concern in most European countries. WBVC cause considerable economic damages and some human injuries. In this study, recent trends for WBVC in mainland Spain road network were analyzed. Data were obtained from traffic reports drafted by Spanish traffic safety authorities. Each WBVC report included the location and time of the accident, and the existence of personal injuries. In six years, between 2011 and 2016, the total number of WBVC occurred in Spain was 38,977, almost 6,500 per year. Despite year-on-year variations, the number of WBVC continues to grow and from 2011 to 2016 has increased by 63%. Since the beginning of the century it has increased fivefold, from less than 2,000 in 2001 to around 9,000 in 2016. Moreover, they were not randomly distributed among all the provinces but tended to concentrate on specific ones: 10 of 47 provinces accounted for 62.9%. WBVC caused 10 deaths, 52 people suffered severe injuries and 1,234 minor injuries. Considering that the average value of economic damages by one WBVC has been estimated at around 2,750 euros, annual losses caused by WBVC in Spain totals 17.5 million euros.

MANAGEMENT OF A CLOSED POPULATION OF WILD BOAR: CULLING VERSUS FERTILITY CONTROL

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Keywords: wild boar, population control, management, modelling

Abstract: Wild boar are increasing worldwide in parallel with their ecological and environmental impact. Traditional methods to decrease this impact rely on culling. Alternative or complementary methods to culling include fertility control. Based on data obtained from a long-term study of the wild boar population of the Castel Porziano Nature Reserve we defined a standard stage-specific matrix model and applied an Approximate Bayesian Computation (ABC) approach to derive parameter values. Using this model we compared the impact of management strategies simulating various levels of culling and fertility control. Our findings simulating fertility control indicated that a constant proportion of 40% sterilisation amongst adult females must be maintained in order to prevent population growth. Higher proportions, 60 and 80%, could reduce the population by 29 and 64% respectively.

URBAN BOARS SHOW LOWER PERCEIVED RISK OF HUMANS COMPARE TO BOARS FROM AGRICULTURAL AREAS AND NATURE RESERVES

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Abstract: Culling wild boars is the most widespread management tool throughout the world. When making foraging decisions, wild boars evaluate the likelihood of being killed by hunters. As the perceived risk of hunting increases, feeding wild boars resort to use anti-predator behaviors that benefit safety at the expense of a reduction in the foraging efficiency and intake. Such anti-predator responses usually involve reducing the time of foraging activity, and exhibiting a more vigilant behavior. Our research goal was to evaluate the combined effects of hunting and different land uses on the foraging behavior and vigilance of wild boars in Israel. To do so, we installed cameras filming feeding devices with corn in four land use – hunting combinations: urban with and without hunting, agriculture with hunting and nature reserves with no hunting. Our results show that land uses significantly affected the amount of corn eaten (ACE) by of wild boars (Kruskal-Wallis test $H(3) = 116.74$, $P<0.001$). In particular, the boars in nature reserves ate significantly more corn compared to boars in agricultural areas. However, urban boars ate significantly more corn compared to boars from agricultural areas and nature reserves (open spaces). Hunting did not affect the ACEs in urban areas. Additionally, we found that boars from nature reserves spent significantly more time around the feeding devices compared to the ones in agricultural areas (Mann-Whitney U test $U_{13,39} = 170.5$, $P=0.038$). Moreover, our results showed that the time it took urban boars to start eating from the feeding devices was significantly lower compared to boars from nature reserves (Kruskal-Wallis test $H(2) = 20.4$, $P<0.001$). We conclude that agricultural boars showed higher vigilance compare to nature reserves boars. Nevertheless, urban boars showed lower vigilance compare to open spaces boars. Our results suggest a lower perceived risk of humans in urban areas, thus managing urban boars will require different management tools from those used on open spaces boars.

BIOGEOGRAPHY AND CONSERVATION OF DESERT WARTHOG *PHACOCHOERUS AETHIOPICUS* AND COMMON WARTHOG *PHACOCHOERUS AFRICANUS* IN THE HORN OF AFRICA

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Abstract: Two species of warthog *Phacochoerus* F. Cuvier, 1826 are currently recognized: desert warthog (DWH) *Phacochoerus aethiopicus* (Pallas, 1766) and common warthog (CWH) *Phacochoerus africanus* (Gmelin, 1788). While CWH is widely distributed over much of sub-Saharan Africa, the distribution, abundance, ecology, behaviour, and conservation status of DWH remain poorly known. Recent investigations in the Horn of Africa (*i.e.*, Djibouti, Eritrea, Ethiopia, Somalia, Kenya; HoA) provide new information on the biogeography of both species.

DWH is confined to lowland xeric environments (typically bushland) where there is constant drinking water. CWH is typically a species of habitat mosaics with more open country, including sub-desert were drinking water is sometimes absent. In the HoA, DWH is present in seven ecoregions while CWH is present in 13 ecoregions, six of which are shared with CWH. There are seven known areas of sympatry between the two species.

The environmental limits (altitude, rainfall, temperature) for DWH are much narrower than for CWH. As such, the geographic range of DWH in the HoA is considerably smaller than for CWH. The Eastern Rift Valley appears to be a geographic barrier for DWH, with the higher altitudes of the Rift Escarpment probably too cold and too wet for DWH.

DWH and CWH are listed as 'Least Concern' on the *IUCN Red List of Threatened Species*. Nonetheless, the abundance and geographic ranges of both species are in decline. The threats, largely driven by a fast-growing human population, include habitat degradation, loss and fragmentation, competition with livestock for food and water, and hunting.

PRELIMINARY FINDINGS OF FACTORS INFLUENCING WILD BOAR DISTRIBUTION IN TEMPERATE FOREST DURING THE WINTER

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Keywords: *Sus scrofa*, wildlife management, environment, habitat, faecal pellet group, GIS

Abstract: Wild boar is a highly adaptable occasional omnivore that perfectly exploits the conditions of contemporary cultural landscape in Central Europe. In the growing season it lives in agricultural crops, where it has enough rest, shelter and food. In the autumn, after the maize harvest, it moves into the forests, where its living conditions are more unfavourable. There wild boar is disturbed by intense hunting, forest cutting, recreation and other human activities, also food resources are limited (depending on mast trees and mast years presence and quantity).

This study focused on the evaluation of the winter wild boar distribution in the study forest complex in the north-eastern part of the Czech Republic, using faecal pellet group counting. Distribution was evaluated at 617 sample plots (each with an area of 100 m2), at the end of two winters (2017 and 2018). The number of faecal pellet group was related to the type of forest environment, geomorphological characteristics, hunting grounds, distances from the nearest feeding site, forest roads, hiking trails, forest edge, intravilan and streams.

This study confirmed that wild boar faecal pellet group density was inversely proportional to the distance from the food source and the forest edge. The highest concentration of faecal pellet groups was in young dense forest stands, regardless of hiking trails, forest roads and areas with intensive forest cutting. The impact of geomorphological characteristics or the distance from the water streams was not demonstrated.

POPULATION STRUCTURE OF WILD BOAR (*SUS SCROFA*) IN THE CZECH REPUBLIC

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Keywords: *Sus scrofa*, age, sex, reproduction, hunt, wildlife management

Abstract: Sex ratio, age and social structure are the key factors for the growth and development of all animal population with sexual reproduction. In the case of wild boar (*Sus scrofa*) in conditions of Central Europe, the population structure plays a significant role in favor of its growth and density. Despite historically highest numbers of hunted boars in recent years, we are still not successful in wild boar reduction in free hunting grounds. In our study, we focused on the evaluation of the sex and age structure in selected wild boar populations in free hunting grounds (two free hunting grounds: FHG) and in hunting preserve (private hunting preserve: PHP) during the main reproductive season. The criterions for localities selection were: the absence of individual boar hunting during the year and hunting only by common hunts. The age and sex were evaluated for all hunted boars from October to the end of January in three seasons (2015/2016, 2016/2017 and 2017/2018).

In total, 665 boars (FHG: 416 indd, PHP: 249 indd), of which 58% were females, were examined. The primary sex ratio in all localities was about 1:1.17 (in favor of females). In the case of yearlings, the ratio of sex was 1:1.86 in FHG (again in favor of females) and 1:0.75 in PHP (in favor of males). The predominance of females in FHP is caused by easy hunting of males that have been excluded from the band (avoiding inbreeding). The absence of the yearling-females in PHP is developed by the fact that they are stayed outside the hunting place (in the breeding herd). For boars over 2 years of age, the sex ratio was 1:3.55 in FHG (in favor of females) and 0:1 in PHP (as adult males were hunted in advance to ensure the safety for hunting dogs and hunters).

Females dominated in all age ranges of the wild boar population, reflecting the current population boom in Central Europe. This is the result of inappropriate wildlife management, especially inadequate regulatory pressure to reproductively active females.

THE OCCURRENCE OF LUNG WORMS *(METASTRONGYLUS* SP.*)* IN A WILD BOAR *(SUS SCROFA)* POPULATIONS IN THE CZECH REPUBLIC

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Keywords: bronchus, density, earthworm, parasite

Abstract: The wild boar has become the most important species of wild animal in the Czech Republic. Its importance grows also in terms of intensive research into its health condition. This study analyses the occurrence of lung worm in selected wild boar populations in the Czech Republic. This parasitic disease is caused by the presence of adult individuals of *Metastrongylus* sp. in lungs of wild boars.

Samples were collected during the collective wild boar hunting events (driven hunts) within 13 localities in two consecutive hunting seasons 2016 and 2017. At each site, samples were taken from 7 wild boars. From each individual, a lung sample and a dung sample were taken. In addition to sampling, the sex was determined for all sampled boars and morphometric measurements of the basic body dimensions, weighing and age estimation were performed according to denture development. In lung samples, the number of adult worms was determined by helminthological autopsy. Dung samples were evaluated by the McMaster method for the presence eggs and oocyst of lung worms - eggs/oocyst per gram (EPG/OPG). The observed numbers of lung worms and EPG/OPG within each wild boar were compared to each other. In addition, an analysis of the intensity of infection of wild boars, depending on their age and weight was also performed.

By helminthological autopsy, the presence of lung worms was detected in 94% of all lung samples. Using McMaster's method, eggs/oocyst were detected in 75% of dung samples. The correlation between the number of adult individuals of lung worms and number of EPG / OPG was analyzed by Pearson´s correlation coefficient r=58. In the case of yearlings (12-24 months), the number of worms within males was up to twice as high as in females. Most lung worms were found in males at the age of 15 months and in females at 14 months of age. In the case of EPG/OPG, the highest numbers were recorded in males aged 5-7 months and in females at 25 months of age. Regardless of gender, the most lung worms were found in 81-90 kg individuals, but the highest number of EPG/OPG was found in pigs weighing 51-60 kg.

In general, this research has shown a high prevalence of lung worms in wild boar populations in the Czech Republic. Also, the intensity of infection of some wild boar individuals is considerable and can affect their overall condition, especially among younger individuals. The deaths of wild boars caused by lung worms are not yet recorded in the Czech Republic.

NATURAL HYBRIDISATION BETWEEN THE COMMON INDONESIAN WILD BOAR (*SUS SCROFA VITTATUS*) AND THE ENDANGERED JAVAN WARTY PIG (*S. VERRUCOSUS*), AS A RISK OF EXTINCTION FOR THE LATTER

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Keywords: Hybridization, introgression, microsatellites, extinction

Abstract: Hybridisation can lead to rapid extinction of threatened species coming into contact with more abundant ones. The Javan warty pig (JWP; *Sus verrucosus*) is endemic to Java, listed as Endangered on the IUCN Red List, and has lost most of its distribution range and declined by 53% in populations size within the last 30 years. On the other hand, the Indonesian wild boar (IWB; *Sus scrofa vitattus*), also known as banded pig, is common and largely distributed on Java. This project's aim was to explore hybridisation between the species and determine whether this phenomenon may pose a threat to the JWP.

We collected 59 tissue, blood and hair samples from JWP, IWB and suspected hybrids between 2006 and 2017. Phenotypic characteristics were used as prior information to assign individuals to each taxaonomic category. In addition, 21 individualised JWP faecal samples were collected at the Cikananga Conservation Breeding Centre (CCBC; West Java) in 2017. We generated a genetic profile consisting of at least 11 microsatellite loci for 73 animals: 40 JWP from CCBC; 14 JWP from Surabaya Zoo; 9 JWP (or suspected hybrids) from different wild populations on Java and 10 IWB from different wild populations on Java.

The Structure assignment test clearly identified two genetic clustering for JWP and IWB. The captive populations genetically were almost pure JWPs, while only two animals from combined wild populations (n=19) were pure JWPs. Two putative hybrids were to 0.50/0.50-threshold; one to a 0.80/0.20-threshold assigned to the IWB cluster. Moreover, two putative hybrids from the wild populations were in fact IWP (0.90/0.10-threshold) rather than JWP. In contrast, no IWB showed introgression from JWP alleles.

In a previous study by Blouch and Grove (1990) based on phenotype classification no evidence of hybridisation in the provinces of Cental Java and West Java was found. However, we detected three and two hybrids for West and East Java, respectively; indication that this is a wider spread phenomenon in the isolated JWP populations today. Given the asymmetry in the hybridization process and the high introgression rate detected, there is a high risk of outbreeding for the small and isolated JWP populations.

RESOURCES OF WILD BOAR IN RUSSIA. CURRENT STATE.

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Keywords: wild boar, resources

Abstract: Wild boar is one the most important game resources in Russia. High ecological flexibility, wide range, ability to increase its quantity define its role in game management. Wild boar gets the second position after moose in the top list of socially important species in Russia.

Wild boar and its dynamics were always under significant attention of zoologists and game biologists. Data on species quantity in Russia within certain administrative regions are patchy and inaccessible for most scientists.

THE WHY AND HOW OF EUROBOAR INITIATIVE

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Keywords: EUROUNGULATES, wild boar, data repository, movement ecology

Abstract: Several papers have highlighted the weakness of ecological researches, when those are characterised by too small sample size and by low statistical power (even for large effect size). Further, the basic principle of experiment replication is jeopardised by the lack of standardisation in the metrics used for covariates. These problems may impact severely the quality of inference. Even in the best-case scenario, the inference is limited to a single population and extrapolation to a broader contest is statistically impossible. This is because a bunch of animals from a single study area do not actually represent really independent samples and extrapolation to other areas is not allowed. These problems are especially relevant for wild boar management because weak inference may lead to poor management and wrong policy recommendations. Large scale inference is a service that wildlife ecologists provide to managers and to policy-makers and it is of the utmost relevance because of increasing wild boar populations worldwide. EUROBOAR, by gathering together wild boar experts and data across Europe, aims at producing valuable knowledge by overcoming the problems recalled above. The available sample size exceeds at least of one order of magnitude what it can be achieved during a single study and the statistical power can be high enough to evidence even a small effect size to investigate aspects of wild boar ecology and behaviour usually overlooked. Availability of several study areas allows more reliable inference at a continental scale. EUROBOAR (with EURODEER and EUROREDDEER) is included in the umbrella project EUROUNGULATES (http://euroungulates.org). EUROBOAR began in 2015 as a proposal to develop a data repository for movement (VHF and GPS collars) and non-movement data (e.g. biometry, reproduction and diet) of wild boar in Europe. Euroboar put in contacts researchers from different fields and with different expertises in order to solve specific scientific questions. To participate, data provision and sharing is not mandatory, simply adhering to the collaborative working philosopy is needed. This philosophy is compiled in a terms of use on which members agreed. Euroboarers use to meet once annually and the group is organised in several working teams each dealing with a specific research topic. At the moment EUROBOAR has 34 participants from 18 countries. The third meeting has to be held in Prague just before the 12th International Symposium on Wild Boar and Other Suids. We report here the recent progresses of the project, an updated number of participants and some details on database.

TRAIT AND HABITAT DEPENDENT NATAL DISPERSAL IN WILD BOAR

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Keywords: wild boar, natal dispersal, dispersal kernel

Abstract: The mechanisms of dispersal have never been studied thoroughly in wild boar (*Sus scrofa*) despite their relevance for explaining the invasion success and predicting the diffusion of transmissible diseases. We analyzed the movements performed by wild boar during the first 18 months of life, using a sample of 784 ear-tagged piglets captured and recaptured between 1995 and 2014 in a protected and fenced Mediterranean oak forest. This long time series of observations allowed us to encompass a large range of climatic, environmental and population-related conditions. We quantified the occurrence of dispersal and tested a number of hypotheses about the mechanisms triggering it. The dispersal rate was assessed at individual and local scale, using a logistic regression, and at study area scale, using time-series analyses. Sex, standardized body mass, sex ratio of the group of captured piglets, presence of sarcoptic mange, habitat quality, acorn production, climatic indexes and local and mean annual densities were used as covariates. The temporal structure of the dispersal rate was assessed via autocorrelation analysis. We computed the dispersal kernel and estimated dispersal distances and the fraction of dispersing piglets using the maternal home range size as threshold. The presence of fences does not affect the results. As already known, most wild boar are philopatric and only a small fraction perform a true natal dispersal. Dispersal propensity was (i) male-biased (23.1% ± 3.0 males and 12.5% ± 2.3 females disperse) (ii) anticorrelated with piglet's body mass, (iii) inversely density dependent and (iv) not explained by local mate competition, inbreeding avoidance or local environmental conditions. Dispersal displacements are larger in males than females (3 and 2 km respectively) and we showed that the presence of a fence prevented only 3% of the longest dispersal displacements. Dispersal rates showed wide irregular yearly fluctuations correlated to large autumn densities and outbreaks of sarcoptic mange. Lastly, dispersal was not for free: wild boar are likely to be shot while dispersing more than philopatric animals and females were found to be more vulnerable than males. Dispersal rates in wild boar are low, differ among years and are shaped by heterogeneities in density more than in habitat quality per se. Piglets move up to settle in high-density areas so dispersal distances are thus determined by the spatial distribution of suitable (more from a social rather than environmental point of view) settling areas. Our study brings useful information about mechanisms driving dispersal in wild boar, which can be used by managers and researchers to better infer population dynamics and space-use strategies of this species.

WILD BOAR MONITORING SYSTEM IN SERBIA

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Keywords: management, distribution, hunting ground, harvest, Serbia

Abstract: The aim of this paper is to analyze the basic principles and development of the monitoring system for wild boar and its habitats in Serbia. We also analyzed the spatial distribution and use of wild boar populations in 2011, 2013 and 2015. We analyzed the data collected by the statistical survey in hunting (Form LOV-11) by the Statistical Office of the Republic of Serbia for the first time at the municipal level in Serbia. We applied ArcGIS and a network of 1 km × 1 km squares, which was developed within the project "SRBREDDEER", financed by the Forest Directorate of the Ministry of Agriculture, Forestry and Water Management.

Our results show that the wild boar monitoring system in Serbia is not adequate and lags behind many European countries. Among other things, some users of hunting grounds refused to provide the requested data, or they provided incomplete and inaccurate data, in spite of the fact that this is an important obligation prescribed by the Law on Official Statistics (2009). The Serbian system of wild boar monitoring, similar to other species of wild ungulates, is based on the estimated spring count and registered culling data, while no one is involved in collecting data on the age, sex and weight of culled individuals at the national or regional level, or the date, time and location of their harvesting.

Out of the total number of municipalities in Serbia (n = 196), wild boar is present in 136 of them (69.4%), while its estimated count was ≈21.300 individuals in the spring of 2015, while registered culling amounted to 7.775 individuals, which is ≈70% of the planned number of individuals to be harvested. In the same period, a high mortality rate of wild boar was recorded, with a total of 1,667 individuals, of which ≈2% was due to collisions with motor vehicles. The current condition is the most favorable in Vojvodina (northern part), where a large number of fenced hunting grounds or fenced parts of hunting grounds have been established along the Danube and Sava Rivers. The degree of use of wild boar populations, which we determined as the ratio of the number of killed individuals to the individuals which die a natural death, according to the estimated spring count, amounted to 44.3% in 2015, of which 36.5% were registered culling and 7.8% registered losses. In 2015 a total of 338 individuals were released from small fenced areas to free nature throughout Central Serbia, which makes this country unique compared to other European countries.

HUNTER´S ASSISTANCE IN PREVENTION AND ERADICATION OF ASF - A FIELD TEST IN THE COUNTY OF HERZOGTUM LAUENBURG (GERMANY)

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Keywords: African swine fever, wild boar, epidemic management, prevention, de-population, restriction, eradication, recreational hunters

Abstract: Up to July 2018 more than 3.000 ASF cases in the wild boar population of the Baltic States (Estonia, Latvia, Lithuania), Poland, Romania, Czech Republic and Hungary have been confirmed in the current year. Due to the main characteristics (low contagiosity, high tenacity and high lethality) of the African Swine Fever Virus (ASFV), the wild boar population is in focus as a virus reservoir. This impacts the hunting management of the wild boar population intensively.

In most countries hunters are the core-stakeholders obliged to manage the wild boar population according to legal requirements and best practice. Up to now the hunter´s impact to limit the spread of ASF seems to be low. Nevertheless, the hunter´s role implementing serious prevention and reliable eradication measures in case of an outbreak is stressed in many official ASF combatting strategies. Taking into account that the human activity is the main vector spreading ASFV over long distances, the risk of ASF introduction to Germany is actually estimated as high. As it seems not to be a question if the virus will occur in the country in the future many federal states promote prevention measures and test the proposed restriction and eradication schemes in case of an outbreak.

We simulated an ASF outbreak in the county of Herzogtum Lauenburg (Federal State of Schleswig-Holstein, North Germany) in a joint field exercise with different stakeholders involved. In local field trials we searched for hidden dead wild boar using searches and hunting dogs equipped with trekking collars. After finding carcasses the correct sampling, salvage and disposal was trained according to the biosecurity advices and hygiene requirements given by the responsible ministerial authority. In our study we evaluated both the practicability of the proposed restriction and eradication measures in case of an ASF outbreak and the prevention measures which focusses on a drastic de-population of the wild boar population. We used date sets of the collared hunting dogs, the feedback of participants of the joint field exercise, an additional questionnaire and the hunting bags of the region for analysis.

The chance to reduce the risk of an ASF outbreak by a preventive depopulation with the help of recreational hunters and their assistance to implement efficient eradication measures in case of an ASF outbreak seems to be very limited.

THE "ROUND TABLE WILD BOAR" IN BADEN-WÜRTTEMBERG

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Abstract: Similar to other regions of Europe, also in Germany the wild boar population is increasing. Parallel to the population development, the associated problems, such as crop damages show an increase. In order to cope with those growing conflicts, the "Landesbeirat Jagd", a board in the frame of the hunting legislation of the federal state Baden-Württemberg, established the "round table wild boar". Since October 2016, the round table is active in several working groups on various key aspects of wild boar management. Aim is to support and to intensify the reduction of wild boar population by providing public support on the regional level, reducing obstacles and improving communication between stakeholders.

One example is the working group "epidemics", which is currently establishing the action plan for the event of an outbreak of African swine fever (ASF). The working group "agriculture", is analysing the situation of crop damages and adapting the system for damage appraisers. Results are to be integrated in the amendment of the JWMG (Jagd- und Wildtiermanagementgesetz [hunting and wildlife management law of Baden-Württemberg]). Further key topics of the "round table wild boar" are the reduction of hunting restrictions and support of the game market.

Within the platform "round table wild boar", the diverse concerns and issues are represented by the diverse stakeholders. In order to successfully resolve conflicts, well-founded data sets are indispensable to maintain objectivity in all discussions and decision-making processes.

PREVENTION MEASURES AGAINST AFRICAN SWINE FEVER FROM A WILDLIFE-ECOLOGICAL PERSPECTIVE

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Keywords: African Swine Fever, wild boar, *Sus scrofa*, hunting, diseases management, counter measures, biosecurity, population reduction

Abstract: As a virus reservoir and vector wild boar plays a certain role in the dynamics of the African Swine Fever (ASF)-distribution on al local scale. But human movements are of greater importance as a distribution vector with regard to a large scale translocations of ASF. Because of high virus contagiosity of infected material, the establishment of biosecurity standards along traffic pathways and an early detection of any virus entry in currently virus free areas is urgently required.

An evaluation of public media shows that especially wild boar hunting is often regarded as an important prevention measures against African Swine Fever.

Population models based on genetic capture-mark-recapture approach give data on sex ratio and hence on female abundance and expected reproductive output in two areas of South West Germany. Female spring population density was around 3 to 10 females per 100 ha. Hunting bag ranged from 3 to 8 harvested animals per 100 ha. Thus comparisons of hunting success with population structure indicate that harvest rate was to low to cause any population reduction. A similar conclusion could be drawn with regard to effects of several measures facilitating hunting of wild boar in Rhineland-Palatinate after outbreak of classical swine fever in the 2002. A continued increase of wild boar hunting bag indicates a further and steady increase in population size as elsewhere in Europe.

These findings may question the simple assumption that any encouraging of wild boar hunting will cause a population reduction to combat African Swine Fever. To hamper ASF-distribution it may be more effective if wild boar hunting could be more focussed on hot spot and risk areas.

OCCURRENCE AND CHARACTERISATION OF SELECTED BACTERIAL PATHOGENS IN THE INTESTINAL TRACT OF WILD BOARS HUNTED IN THE CZECH REPUBLIC

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Keywords: *Campylobacter*, *Listeria*, *Salmonella*, *Sus scrofa*, zoonosis

Abstract: Presence of zoonotic pathogens in the intestines of food animals represents a potential source of meat contamination. Faeces of wild boars hunted in years 2014-2016 in 70 hunting areas in different parts of the Czech Republic were analysed for presence of selected pathogens by cultivation methods (ISO norms). Very low prevalence of *Salmonella* spp. (0.4%), *E. coli* O157 (0.8%) and *L. monocytogenes* (3.3%) was found (N=242), suggesting that the population of wild boar in the Czech Republic is not an important reservoir of these pathogens. However, the overall prevalence of thermotolerant campylobacters was 54.6% (N=606), with *C. coli* being the predominant species present in 46.9% of samples, followed by *C. jejuni* (13.4%). The results suggest that there's a significant probability of contamination of wild boar meat by campylobacters in the case that the gut content spills out on meat surface, emphasizing the importance of good shot placement and good practice during evisceration and further handling of the carcasses.

MANAGEMENT OF HUMAN-WILD PIG CONFLICTS IN DENSELY URBANISED AREA – THE CASE OF HONG KONG

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Keywords: human-wild pig conflict, habituation, contraceptive treatments, GonaCon™, endoscopic neutering, castration

Abstract: While wild pig (*Sus scrofa*) was once considered near to extirpation in Hong Kong in the 1950s, the species has now recolonized almost all countryside areas throughout the territory. In recent years, wild pig has adapted to thriving near human settlements. Some of them become habituated to stray into urban fringe for anthropogenic food, often resulting in conflicts with local communities. The situation is reflected from the handling of over 2,000 public reports related to wild pig sighting or nuisance by Agriculture, Fisheries and Conservation Department (AFCD) of the Hong Kong Special Administrative Region Government between 2011 and 2016. In 2017, the public reports have reached a new record high over 700 cases.

In the past, hunting operations had been adopted as the last resort to deal with persistent wild pig nuisance in rural areas of Hong Kong. However, hunting operation is considered not feasible due to the public safety concern of using firearms near residential areas. Recently, there have been strong opposition against hunting operations from animal right and welfare perspectives. In view of that, there is a pressing need for new control measures to alleviate the human-wild pig conflict situation. Contraceptive control for the habituated wild pig offers an alternative to lethal control.

AFCD has launched a pilot scheme of "Capture, Contraceptive and Rehome/ Release Programme" ("CCRP") since 2017 as one of the multi-pronged approaches to deal with the increasing human-wild pig conflicts. In addition, the scheme is to examine the effectiveness of GonaCon™, an immuno-contraceptive vaccine, on controlling the reproduction of wild pigs. CCRP creates opportunities for AFCD to test different mitigation methods and conduct scientific studies with a view to better managing the conflict caused by wild pigs. AFCD will monitor the wild pig populations covered by the pilot scheme to evaluate the effectiveness of the scheme by the end of 2019. In parallel, AFCD is developing field surgical routines, including endoscopic neutering and castration, for long-term controls of the habituated wild pigs.

MICROSATELLITE ANALYSIS OF WILD BOAR GENETIC VARIATIONS IN LITHUANIA

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Keywords: African Swine Fever, microsatelitte analysis, wild boar

Abstract: Currently, one of the biggest problems in Lithuania is the spreading African swine fever - the one of the most serious disease of wild boar and domestic pigs. Many infected, dead wild boars are found in the infected area, but in this situation, the subspecies of wild boars are almost decreasing marginally. It has not yet been proven that there is a link between the wild boar genotype and the resistance to African swine fever. Maybe certain individuals or their groups are resistant to the virus. The purpose - investigation of the genetic variations of wild boar sampled in areas infected with African swine fever. First portion of analysis was genetic investigation of 96 ASF positive samples during 2014 – 2016 using Microsatellite analysis method. The microsatellite loci were selected from FAO recommendation (2011. Molecular genetic characterization of animal genetic resources. FAO Animal Production and Health Guidelines. No. 9. Rome). Microsatellite locus analysis were performed using multiplex PCR amplification: 9 – plex (for locus SW24, S0107, S0068, SW353, S0386, S0355, SW72, TNFB, S0070) and 7 – plex (S0026, S0155, S0005, SW2410, SW830, SW632, SWR194). PCR products were analyzed with ABI3100 sequencer using GeneMapper 3.7 version software. The samples were divided in to 5 groups representing infected district of Lithuania: Vilniaus, Kauno, Utenos, Panevezio and Alytaus district. Among the analyzed 16 microsatellites markers the highest variation is in S0005 locus and in locus SW24. The lowest variation is observed in locus S0068 and S0355. The highest amount of homozygous variants per locus have locus S0355 (59), locus SW353 (55) and locus S0107 (41). Analysis method will be applied to the analysis of other African swine fever positive wild boar samples collected in 2017-2018.

CHANGES AND PATTERNS OF ACTIVITY IN WILD BOAR

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Keywords: activity pattern, diurnal, nocturnal, rhythm, *Sus scrofa*

Abstract: Wild boars (*Sus scrofa* L.) are increasingly attracting public attention because of growing populations. Besides wild boar density, the cases of African swine fever in Eastern Europe pose a new challenge for wild boar managers in Europe. However, the mostly shy lifestyle and predominantly nocturnal activity of the species complicates wild boar management. Widening the knowledge of wild boar ecology can contribute to develop science based management strategies.

We wanted to illuminate the activity rhythm of wild boar and to understand the determinants of variation in activity.

From 2012 to 2015 we equipped 34 wild boars in three regions of southwest Germany with GPS-collars and activity sensors. We assigned the measured activity to the recorded locations as well as individual attributes, time, landscape characteristics and disturbances. For analysing, we computed mixed generalised additive models.

The wild boars behave active during mean 41.3% of a day. The activity pattern is mostly affected by the course the day and wild boar are most active around midnight. The influence of other factors on wild boar activity is much lower and differs between the regions.

Our findings suggest strong adaptiveness of wild boar on local environmental conditions.

UNDERSTANDING AND COMBATING AFRICAN SWINE FEVER IN EUROPE (ASF-STOP) - COST ACTION NETWORK-ACHIEVEMENTS IN ITS FIRST 2 YEARS

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Keywords: African Swine Fever, COST, network, wild boar, pig, EU

Abstract: "ASF-STOP-Understanding and Combating African Swine Fever in Europe" is a multidisciplinary network of scientists financed by the COST EU programme. Its main aim is to address the challenge of mitigating African Swine Fever (ASF) from spreading further in Europe and protecting the European pig industry by combating ASF through a comprehensive, multi- and interdisciplinary approach. The project started in May 2016 and will run April 2020. ASF-STOP includes 31 European countries represented in the decision-taking body, the Management Committee (MC). The action includes additional countries, international organisations and private companies. As a whole, the network includes about 220 participants divided into five working groups (WG1: ASF virus, WG2: ASF in wild boar, WG3: ASF in domestic pigs-pig industry, WG4: ASF infection dynamics and control, WG5: integration of knowledge and communication of results) work towards the achievements of the networking and scientific objectives. Some of the activities in the first two years include: i) country meetings (at least twice a year), ii) dissemination actions: website, publications, reports, presentations at International Conferences and fora iii) Training activities (cf."Training on ASFV passive surveillance in wild boar" in Estonia), iv) grants for young investigators to conduct research while hosted in expert laboratories in various European countries, and iv) conference Grants to young investigators from inclusiveness target countries.
The presentation will summarise the main achievements towards the scientific, training and strategic objectives obtained during the first two years of ASF-STOP and will give an overview of the working plan for its third year. It will equally emphasize the need to interact with biologists and game managers in the implementation of diseases management and control activities related to wild boar populations.

MANAGEMENT OF WILD BOAR POPULATIONS UNDER THREAT OF AFRICAN SWINE FEWER

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Keywords: wild boar, management, african swine fewer

Abstract: The current populations of wild boar are characteristics especially by high proportion of females and piglets and very low proportion of adult males. The reproduction rate is high and important part of piglets comes from young mothers. The main environmental conditions, which caused this strategy of wild boar, are: 1. Low importance of natural regulations of wild boar populations by large carnivores and severe winters; 2. High mortality of piglets in first year of life by hunting; natural and artificial food supply during winter and protection of mothers with piglets by hunters.

These all factors together lead to permanent growth of wild boar numbers and abundant populations represent threat to expand African swine fewer. The main task of game managers is to lower the risks of spreading ASF. The main tools for wild boar management are hunting and feeding. Both hunting and feeding could both increase and decrease risk of ASF according to environment, density of wild boar, season, hunting methods etc.

Existing experiences show that ASF could spread also in localities with low density of wild boar ($0,5$ ind/km^2). Safe density of wild boar, which does not allow spread, ASF is probably too low to be achieved by normal hunting. Reduction of wild boar is important to lower the risk of ASF and for lower costs. Hunting in regions where ASF is present is risky due to possibilities to spread the infection by increase movement of wild boar and by manipulation with the carcasses. Carcasses of dead wild boar lying in forest are dangerous only for local population of wild boar, but hunted wild boar can spread ASF to many kilometers. Elimination of wild boar from infected locality can eliminate the ASF but feasibility this management is low.

Feeding and limitation of hunting can stabilize wild boar populations with many positive effects for their management. The first measurements on infected area should be stop hunting and start feeding. Subsequent regulation of wild boar number should not increase the risk of speeding the infected area.

CONFLICTS IN WILD BOAR MANAGEMENT IN THE FOREST OF DEAN, UK

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Abstract: The Forest of Dean (FoD) is a 42.5 square mile area of woodland in Gloucestershire, England. Wild boar (*Sus scrofa*) have been established in the FoD for almost 20 years after an absence of 700 years. The population has grown to approximately 1500 from 60, despite management efforts. Wild boar are increasingly seen roaming outside the FoD into the surrounding farmland, countryside, towns and villages. The FoD is a national tourism hot-spot, with many paths dissecting the woodland, outdoor activity centres, and holiday properties located within and around the forest. Consequently people-boar interactions have increased in recent years creating growing concern among residents. Increasingly residents and local authorities are in conflict with each other over boar management. Using data from interviews with residents and users of the FoD and an online questionnaire I examine these conflicts and discuss the feasibility of possible mitigation strategies proposed by participants.

Research data show that all but a few participants have had a negative interaction with wild boar, ranging from road traffic accidents, being charged and knocked over, to boar blocking walking routes. Despite these interactions, many participants expressed that the wild boar should be kept in the FoD, with only a few stating a need for extermination. Due to boar numbers increasing despite culling efforts, residents exhibit some distrust towards the authorities managing the FoD. Interviewees indicated they thought the current culling is ineffectual at managing boar numbers. Participants proposed possible management strategies, including lethal methods (gun and bow hunting, erradication) and non-lethal methods (fencing), and biological management methods through contraception, and introducing new species – nematodes and wolves.

All these management strategies have inherent flaws, linked both to the FoD and wild boar biology. My findings suggest that culling of wild boar is the most feasible option for the FoD population, but current methods are not suited to the FoD. Changes to implement include a closed season when young are dependent on sows, culling from the edges of the forest rather than current culling from within the forest to encourage the boar to stay inside the forested area, and allowing boar cull-free zones within the forested area away from human settlement. Such changes would meet current concerns over wild boar management and lower the number of people-boar interactions.

ASF ON THE WEST BANK OF THE VISTULA RIVER IN WARSAW; ASF WHERE ARE YOU GOING?

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Abstract: African Swine Fever (ASFV) appeared on the European continent in 2007 after 8 years of his absence. The virus has been dragged from Africa to Europe by sea. ASFV is not dangerous for humans. However, it is very important economically in agriculture. In the case of finding even one sick pig, farms counting up to several thousand animals are eliminated. Initially, the virus spread far from Europe in the Caucasus countries: Georgia, Armenia, Azerbaijan, and part of the Russian Federation. Over the next years, however, the virus moved towards the borders of the European Union. The main vector of virus movement was human (not wild or farmed animals). In 2014, the first case of ASFV was found in the east of Poland near the border with Belarus. For a long time veterinary services, hunters, foresters and farmers managed to block the virus in the east of Poland. Unfortunately, in the first half of November 2017, the first dead, infected wild boar on the outskirts of Warsaw was found. The Warsaw agglomeration is located at the intersection of ecological corridors located along the Vistula and Narew and Bug rivers. Initially, it was claimed that the barrier for the spread of the virus towards western European Union countries would be large watercourses, and above all the Vistula. It was a mistaken statement because in the second half of November 2017, four dead boars were found six kilometers west of the Vistula River. Infected and dead wild boars were also increasingly found in wooded areas in Warsaw. Following the recent years of the virus moving towards the western border of Poland with Germany, the authors tried to predict the possible routes of the virus. The spread of the virus includes both the movement of wild animals as well as existing and potential migratory routes, ecological corridors and the movement of people.

A COMPARISON BETWEEN CAMERA TRAPS, ACTIVITY SIGNS AND HUNTING INDICES FOR EVALUATING WILD BOAR ABUNDANCE

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Keywords: CPUE, digging, REST model, SPUE, rubbing

Abstract: For a few decades, in Japan, wild boar *Sus scrofa* has increased their density and distribution. Expanding wild boar population has been causing serious agricultural damage and also increasing risk of zoonotic disease. For management of wild boar population, their local population density is a fundamental information, however it's difficult to estimate. Sika deer is also a common mammal species in Japan, their population dynamics on a broad spatial scale is estimated by using a Bayesian state-space model with multiple density indices such as density of pellet ground, SPUE (the number of deer seen per hunter per hunting day), box trap CPUE (the capture per one night). Only hunting index is a density index of the wild boar. Thus, in this study, to evaluate density indices of the wild boar, we compared between camera traps, activity signs and hunting indices.

We conducted activity signs in 16 survey sites (5×5km) between October and December 2017 in Hyogo prefecture, western part of Japan. The number of digging on the ground and rubbing on the tree trunk were counted about 5km×2m transect along mountain ridge in each study site. To compare activity sings with population density, we estimated local population density by the random encounter and staying time (REST) model (Nakashima et al., 2017) based on camera trapping. Camera trapping were conducted for a month between September 2017 and February 2018. In addition, we also compared activity sings with three hunting indices, SPUE, the box trap CPUE and the snare trap CPUE.

Density of digging and rubbing were only correlated with local population density estimated by camera trapping at same survey period. In southern part of Hyogo prefecture, density of digging were correlated with boar density, however density od rubbing were not correlated. This result suggested that density of rubbing differs according to each region.

COMPARATIVE STUDY ON HEPATIC AND INTESTINAL DRUG METABOLISM IN WILD BOAR AND DOMESTIC PIG

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Keywords: xenobiotic biotransformation, cytochrome P450 enzymes, ecotoxicology

Abstract: Drug-metabolizing cytochrome P450 (CYP) enzymes are highly involved in hepatic and intestinal detoxifying processes, and their function is of special importance in wild animals, directly exposed to environmental pollutants. Concerning hepatic CYPs, limited data are available regarding wild ruminants, while absolutely no information can be found about wild boar and with regard on the intestinal drug metabolism in any hunted wild animal species. In the present study, we aimed to assess the specific activity of certain CYP enzymes playing key role in xenobiotic biotransformation in wild boar and domestic pig.

Liver and duodenal mucosa samples were freshly collected from 47 hunted wild boars in Western Hungary (from the area of Sopronkövesd and Sárvár), while domestic pig samples (n=40) were gained from a slaughter house. The post-mitochondrial supernatant containing CYP enzymes was isolated after homogenization of tissue samples by a multi-step differential centrifugation. Specific activity of CYP1A2, CYP2C9 and CYP3A4 enyzmes was assessed by luminometric P450-Glo assays.

The activity of hepatic CYP1A2 enzymes was significantly (P=0.008), approx. 4-fold higher in wild boars than in domestic pigs. Similarly, the activity of CYP3A4 was found to be significantly (P<0.001), approx. 8-fold increased in the liver of wild boars when compared to those of domestic pigs. In contrast, hepatic CYP2C9 had a significantly (P<0.001), 50% lower activity in wild boars than in domestic pigs. The activity of intestinal CYPs was under detection level in both species.

According to our results, great differences could be observed in hepatic drug-metabolizing CYP activities between wild boars and their domestic counterparts. The described isoenzyme-specific, species-related alterations might be explained with the different exposure of wild and domesticated animals to specific CYP modulators, taken up from the environment or with the diet. As the activity of CYPs in wild boars can be highly influenced by environmental pollutants, following further studies, CYP enzymes may be applied as ecotoxicological markers of common agricultural or industrial toxicants. Investigating CYP-related drug metabolism in wildlife species can clarify some possible toxicokinetic interactions, thus having huge importance in the production of safe game meat, being free of toxic residues.

A CAPTURE NETWORK AS A TOOL TO IMPROVE WILD BOAR MANAGEMENT IN WALLONIA (BELGIUM)

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Keywords: eartag, juvenile growth, survival rate, movements

Abstract: For a few years the Walloon administration has set up a network of capture sites of wild boar juveniles. The objectives are to get data about juvenile growth, as an interesting proxy of reproduction, survival rate and movements. About 20 capture sites totalizing more than 50 cages are spread all over the distribution area and managed by voluntaries within a legal framework. Different stakeholders are involved: mainly hunters but also foresters and sometimes farmers. From 300 to 700 piglets (1.5 to 3.5% of the annual hunting bags) are captured and ear-tagged each year ($n_{2005-2016}$ = 4563). All piglets are sexed and weighed before release. The annual recapture rate ranges between 0.39 and 0.56. The mean growth within the first year of life (n = 938) is 0.14 kg/day with a high variation in time and space. The mast availability seems to explain at best the variation in time, and the crop availability, specifically wheat crops, the variation in space. The coefficient of variation of the growth is higher in areas with low availability of wheat crops. As expected, 96% of the recaptures occurred by hunting. Even if wild boar is hunted all year long, the autumn is the most intensive period of harvesting (88%) when hunting by drive in the forests is allowed. The cumulate recapture rate is of 65%, 89% and 97% after the first, second and third drive seasons respectively, with a high variation according to the area. The composition of the hunting statistics of ear-tagged individuals was 27% and 29% for small females and males, 11% and 10% for medium and 8 and 14% for large ones during the drive season, with a high variation according to the area. The movements between the capture and the recapture sites were lower than 10 km for 96% of the females and juvenile males and 87% of the (sub)adult males. Many important motorways and railroads are crossed during dispersal events. The information about growth, survival and movements can be spatially linked to the game management units in order to highlight the local specificities of the wild boar populations and to help hunters in improving their management.

IS THE WILD BOAR ALWAYS READY? A REVIEW ABOUT THE SEASONALITY IN REPRODUCTION OF WILD BOAR MALES (*SUS SCROFA*)

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Keywords: seasonality, reproduction, wild boar

Abstract: Seasonality is shown in reproductive behaviours as a result of variation of climatic and dietary factors. In the arctic, strong seasonality is manifested; mammals breed in a very restricted period. In the tropics seasonality is less pronounced and is regulated more by rainy seasons than by photoperiod. In the temperate zone most mammals breed seasonally. The *Suidae* family, covering a wide range of habitats from high latitudes to the equator, shows a variety of reproductive pattern. Some genera of this family are reported to breed year-round and some show seasonal reproduction depending on the geographically distribution. The European wild boar is considered until nowadays a strictly seasonal breeder. The reproductive function of wild boar females is amply studied whereas the breeding pattern of the males is less considered. Therefore the current knowledge about the seasonality in the reproduction of the wild boar male has been summarized. The literature search was set up to 2018 in Google Scholar, Web of Science and additionally within the own database. Within merely 24 studies found from Europe and Brazil, 20 were relevant for the topic (incl. 6 papers dealing with seasonality of female reproduction). Numbers of sampled animals in captivity (14/24 studies) were usually smaller than numbers of wild boars killed by hunting. Otherwise captive reared wild boars could be observed year-round while free-ranging animals were sampled mainly during hunting season.

In conclusion: there is no unique opinion whether the wild boar male is a strictly seasonal breeder. Recently there seems to be a reduction of seasonality due to climatic changes in temperate Europe. Wild boar males may potentially reproduce throughout the year. Although the intact number of spermatozoa might be lower in summer, there weren´t marked differences between seasons in terms of semen quality. Wild boars come in heat also in uncommon months. Males, as females, reach puberty quite early and complete spermatogenesis at already nine month of age. In the scenario of the assumed promiscuous mating system, young males could contribute to reproduction besides dominant adults and this would fit into the hypothesis above. Although this review has a restricted basis it gives an overview of the ecological plasticity of this species. Wild boar males are more or less seasonal breeders depending on latitude, nutrition and climate.

ECOLOGICAL CORRELATES OF WILD BOAR EXPANSION TO THE NORTH OF WESTERN SIBERIA

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Abstract: In this study we question the factors that could promote expansion of wild boar to the environment which lacks any habitat used by the species in the core part of the geographical range. To answer this question we briefly describe the trends in wild boar range expansion in Russia in the XX century and the hypothesis explaining this phenomenon. Then we look at the possible reasons of wild boar expansion expactly to the north of Western Siberia and factors that could explain it. Finally we present first results of modelling the wild boar distribution in the study area and discuss the factors affecting it at the regional level.
In the end of the XIX century the wild boar populations have decreased and the species disappeared from most part of Russia and eastern Europe. The expansion of wild boar to the northeast in Eurasia has been observed since the middle of the XX century. It originated from both the natural increase of species populations in the Baltic region and animals' introductions in the Central Russia. In 1950-s – 1960-s wild boars settled most part of the Central Russia, while in 1970-s they expanded to a number of regions in the north-eastern direction. Already in the beginning of 1990-s the records of wild boar were made up to 61-62 degrees northern latitude. Three hypothesis were suggested to explain the rapid expansion of wild boar to the north-east of Eurasia: availability of high-energy food on the agriculture fields, mild winters and decrease of wolf population.
First record of wild boar in the north of Western-Siberia (administratively HMAO-Yugra region) was made in 1984. In the end of the XX century wild boars naturally expanded to Yugra region from the territories of the southern regions and in the XXI century established the stable populations up inhabiting areas up to 62 degrees northern latitude. The data about presence records were used to model species distribution and estimate the effect of different habitat on it. Generally the main variables affecting species distribution were the distance to water reservoirs and type of bottomland habitat. We did not observe the clear negative effect of any variables limiting species distribution to the north-east. Despite the climate warming has been observed in Western Siberia in the last decades, this was probably not the main factor affecting shift of the wild boars' northern range limit.

OPTIMISATION OF A CENSUS METHOD USING CMR TO ASSESS WILD BOAR DENSITIES

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Keywords: mark-resight, non-invasive method, population size, feeding spots, Robust design, Program MARK, *Sus scrofa*

Abstract: The aim of the research was the optimisation of a method which lies on the self-marking process of wild boars on several feeding devices, distributed over a study area monitored by camera traps. By using marking crayons (for cattle) of distinct colours, we managed to identify the compagnies individually, and used them as the counting unit. We were able to follow their movements across the study area as well, as every feeding spot was supervised by camera traps, and additional ones were set up on wallows. We used the Poisson-log normal estimator in Program MARK to estimate closed population abundance, and abundance through time (Robust design). The survey has been conducted in Neuchâtel (Switzerland), in a mountainous forest area boarded by a rocky cirque and a little river. This method is meant to be non-invasive, cost effective and easy to reproduce in other areas. Furthermore, this research is coherent with the EFSA (European Food Safety Authority) project called E*NET*WILD, whose aim is the collection and harmonisation of data on the geographical distribution and abundance of wild boar across Europe.

GENETIC STRUCTURE OF THE HUNGARIAN WILD BOARS (*SUS SCROFA*) – INITIAL RESULTS

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Keywords: wild boar, Hungary, genetic structure, STR

Abstract: The wild boar (*Sus scrofa*) is one of the most important big game species in Hungary, with significant ecological and economical impacts, therefore investigating their genetic profile and the spatial location of the populations/subpopulations is necessary.

The main objective of the study was to assess the genetic diversity and population structure of the Hungarian wild boars. Up to now a total of 235 wild boars samples were collected from all across Hungary. Genomic DNA was isolated and genotypised with a marker set of 13 STR markers (PigSTR1A, PigSTR1B, PigSTR4B, PigSTR4C, PigSTR5C, PigSTR7B, PigSTR11A, PigSTR11B, PigSTR13E, PigSTR14A, PigSTR14B, PigSTR15A, PigSTR17B) that processed by literature data and adapted to local conditions.

From the 13 analysed loci 8 presented significant deviation from Hardy-Weinberg equilibrium conditions (PigSTR4B and PigSTR4C in $P<0.05$ and PigSTR1B, PigSTR5C, PigSTR7B, PigSTR11C, PigSTR13E and PigSTR15A in $P<0.001$ significance level). In every case the Ho was lower than the He (Ho mean=0.395 SE=0.052, He mean=0.460, SE=0.064). The number of alleles varies from 4 to 13 (6 alleles in average, SE=0.725), the effective number of alleles are between 1.139 and 4.589 (2.245 in average, SE=0.305). Allele frequencies varies from 0.002 to 0.936 (0.167 in average). The used population structure programs (Geneland and Structure) both suggested 5 subpopulations in Hungary. Two subpopulations are mostly located in the North-Eastern part of Hungary, one in the Western part. The last 2 subpopulations seems not to be separated geographically.

Further on the wild boars' hybridization level will be investigated. A reference set was set up with common domestic pig species. With the STR set supplemented with 3 markers designed to species identification 63 wild boars were tested, and only 2 hybrids were found, but a more specific set with the STR set plus 6 species identification markers is under development for even more reliable results. Also increasing the number of samples is planned.

SELECTION OF DIET BY WILD BOAR (*SUS SCROFA*) IN FLOODPLAIN FORESTS IN THE CZECH REPUBLIC

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Keywords: wild boar, natural food, feed, supplement diet, game preserve

Abstract: A wild boar (*Sus scrofa*) survives in different environments and it is successful reproduces. It is a very successful and competitive species due to its wide diet valence. Throughout the year, it has quality diet, reproductive success, and is a favourite game for hunters. It becomes a serious conflict species. Although it is a native species for European ecosystems, it is often discussed the overgrowth and problems it poses for cultural landscape and ecosystems. In the floodplain forests the wild boar is referred to natural food, but during the hunting season, it is given supplement feed. It has a wider range of diet components.

The study focuses on the influence of natural and supplement feed of the wild boar in the autumn and winter season at the site of the Soutok in the Czech Republic. It also summarizes the dynamics of diet intake and the preference of individual components in the context of feeding. Preferred diets are energy rich components such as acorns, beechnuts, maize etc., regardless of the natural food and supplement feeding. These components comprise a majority share and significantly affect the behaviour of boar at different periods, depending on availability.

Samples for evaluation were taken from the stomachs of the caught boar, the content was subsequently analyzed by the classic volumetric method.

Boars can very effectively respond to the availability of different diet components and prefer the most energy-rich diet in a given period. It is the most dominant species that can quickly consume natural components, it is multiplied by unnaturally high population density. In the winter period, large populations are dependent on feeding. The supplement feed, most commonly maize, is continually consumed in direct feed dependence.

AFRICAN SWINE FEVER, HUNTING AND WILD BOAR: INSIGHTS OF A COMPLICATED RELATIONSHIP

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Keywords: population dynamics, mortality, management, disease

Abstract: African Swine Fever (ASF) is a highly infectious haemorrhagic DNA virus, with a high mortality, targeting the Suidae family. The virus is endemic to the African continent but outbreaks were observed for the first time in Europe in the early 1960's. Apart from Sardinia, ASF was totally eradicated from the EU in the early 1990's. In 2007 however, the virus reappeared on the Eurasian continent (outbreaks in Georgia), followed by a further spread towards Western Europe. The causes of the spread of the virus are multiple, e.g. human transport of infected meat/animals, infected material, contact between wild and domestic pigs.

Since no vaccine is available to control and eradicate the disease, the pathogen constitutes a major threat for the world pig industry. As wild boar also is a vector of ASF, in countries where ASF occurred, wildlife management has focussed on a strong reduction in wild boar numbers to control the disease outbreak. As a result, there is virtually no knowledge on the real impact of the disease on the wild boar population (e.g. mortality, reproduction, recovery potential) under natural, unmanaged conditions. Moreover, the effectiveness of population control and effects of hunting on ASF spread are unknown and thus intensively debated. The Białowieża forest, where ASF arrived in 2015, offers an interesting study system with an area with traditional wildlife management and an area without hunting adjacent to each other.

Using 6-years (2012-2017) of camera trap data, we studied the consequences of the ASF outbreak on the population size and structure of wild boar in the managed and unmanaged parts of the Białowieża forest. The relative index of abundance (camera trapping rate) showed that ASF reduces wild boar population by more than 90% in both the area with and without hunting, two years after the disease arrival. Our results indicate that hunting had no additive effect on wild boar mortality compared to mortality induced by ASF. Further we observed that high hunting pressure had an unexpected impact; increased wild boar density in the border zone between managed and unmanaged areas and increased fertility, potentially increasing the risk of disease transmission within the population.

Our study suggests that population control does not have an additive effect on ASF-induced mortality and can induce reserve effect, which questions the effectiveness of population control when ASF is already present in an area. In order to confirm this result However, additional analyses need to be performed to confirm this hypothesis.

THE STATUS OF AFRICAN SWINE FEVER (ASF) IN HUNGARY

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Keywords: wild boar, ASF, prevention

Abstract: Wild boar plays a significant role in wildlife management in Hungary. A total of 143,081 wild boars were bagged in 2016, accounting for 43% of all bagged big game. Of the total number of boars bagged, 8.16% were hunted in closed game reserves; these hunts occurred in approximately 100 closed wild boar game reserves. The national average for wild boars bagged in free areas is 1.42 individuals/ha, while the highest value, 3.12/ha was in Nógrád County.

Due to the significance of wild boar in Hungarian wildlife management, intensified measures were taken to prevent the spread of ASF to Hungary after the virus appeared in the Ukraine. Despite these prevention efforts, the pathogen was officially detected on April 21, 2018 in Gyöngyös (Heves County), approximately 200 km from the Ukrainian border. The reasons behind the appearance could not be accurately determined, but the role of transport traffic on the M3 motorway can be assumed. Subsequently, the pathogen appeared near the Ukrainian border in Szabolcs-Szatmár-Bereg County on May 15, 2018. In this case, the possibility of natural propagation can no longer be ruled out. The infection was confirmed in June 2018 and by June 15, it had killed 24 wild boars, 11 in Heves County (5 settlements) and 13 in Szabolcs-Szatmár-Bereg County (7 settlements).

The authorities have taken the necessary measures at the national level, including mandatory mortality reporting (compensation) and compulsory sampling, domestic pig swine fever assessment, increased control of food waste management (contaminated sites and transit routes) from infected countries. In the case of high-risk zones, compulsory measures include disposing of dead individuals (compensation) and increasing the number of planned hunts (females 30%; youngsters 25%) (compensation). The following is also mandated in these high risk zones: direct mortality searches (compensation), group hunting in free areas with permission only, and the utilization of bagged wild boar only after a negative virological examination (this applies to trophies as well). Other measures include compulsory collection and destruction of viscera, restricting feeding to hunting purposes (max 10kg/km^2), the compulsory protection of closed game reserves with a double fence, and the liquidation of the reserve if it fails to implement this measure. Banning the transport of wild boar outside the zones and enhanced veterinary inspections of domestic pigs have also been implemented.

HABITAT USE OF WILD BOAR AND ITS SEASONAL CHANGES IN A HUNGARIAN TEMPERATE FOREST

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Keywords: wild boar, habitat use, habitat preference, forest

Abstract: The study site is a forest block of more than 20,000 hectares surrounded by agriculture land located in Somogy County. In terms of forest stock, the highest proportion of trees in the area were oaks (pedunculate oak and Turkey oak). During the study, 21 adult wild boars were fitted with GPS collars. The habitat usage rate is given as a percentage of the number of positions in each habitat type. To determine the supply, we used MCP-defined habitats as percentages. Habitat preference was calculated using the JACOBS index. The movement activity of the collared animals was calculated from the distance between the two adjacent positions. We used the period of lowest activity (11:00-13:00) to determine the daytime hideaway areas.

Forest area use was extremely high throughout the year with 93% of both males and females. Seasonally, forest use among sows was the lowest in August (80%) and in September (85%). Intensive agricultural activity and a high prevalence of corn was typical during these months. The lowest forest use value for boars was in July (71%). During this time, more than 90% of the positions recorded in open areas were associated with grains. Among the main tree stand species, females used alder and oak considerably, and alder seasonally from spring to autumn, while the use of oak trees was significant from the autumn to spring, supplemented by forest pines. Males showed less seasonal deviation; in addition to the tree species used by females, males also used black locust. The movement activity of individuals peaked at dawn and at twilight, of which the evening peak was higher. This higher value was due to the existing alternatives to open habitats. Concerning cover use, 38% of collared individuals spent the day in oak stands, while 30% remained in alder stands. In the case of oak, the use of 0-20-year-old trees was characteristic, while with alder, trees aged 10-20 and 50-60 years were preferred.

TEMPORAL PATTERN OF DAMAGE CAUSED BY WILD BOARS TO CROPS IN THE LANDSCAPE OF EXTENSIVE AGRICULTURE IN CENTRAL POLAND

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Keywords: wild boar, damage to agriculture, crop protection

Abstract: The dynamic growth of the wild boar population in Europe and the intensification of the problem of damage to agriculture is related to the change in the structure of agricultural crops and the growing area of maize. This problem also occurs in Poland. However, there was a period of 90 years, when in the central part of the country, due to the relatively small area of fields (from 0.57 ha to 14.5 ha) and poor soils, maize was not widely cultivated. After the economic crisis in the late 1980s, there were no longer any root crops (mainly potatoes) that were very popular in Poland in the 1960s and 1970s. Agriculture assumed the character of an extensive farming based on cattle breeding, cereal cultivation and vegetable growing on small scale. This situation gave the opportunity to observe damage in unusual trophic conditions between root crop periods and maize. The damage was registered by the State Forest Service according to the same method for 10 years (2000 - 2009). Every year, farmers reported from 30 to 250 cases of damage caused by wild boars in the hunting ground of Spała Forest District. In total, 5630 cases of damage were registered in the reported period. The damage had two periods of high severity. The first was spring. In April, wild boars mainly damaged meadows. However, no damage was noted in young cereals (winter crops). In the period from May to the end of June, the damage significantly decreased. Again, and the sudden increase in damage took place in cereal crops during the period of grain ripening in the period from July to August. Due to the small area of the fields, the damage was proportional to their size. The only exception was damage to potatoes from early summer to autumn and damage to meadows in early summer. In the first case, the damages were disproportionately larger than the area of meadows, while the second ones were smaller. The results of research can be helpful when undertaking protective measures - securing crops with fences, intensification of hunting, etc.

COMMUNITIES, PUBLICS, RESPONSIBILITIES: THE PROBLEMATIC NATURE OF ENGLAND'S BOAR STRATEGY

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Keywords: governance, biosecurity, stakeholders, publics, place, conflict

Abstract: After extirpation around 800 years ago, over the last 30 years wild boar have returned to pockets of the British countryside. In areas where populations have been able to establish and flourish, their return has been contentious and socially divisive. For some people, boar are perceived as heralding a new, exciting landscape otherwise emptied of large mammals and wildness. For others, they bring an undesirable biosecurity risk and threaten long-established relationships with place.

This paper introduces some of the key debates that circulate around wild boar belonging and governance in England. In particular, it looks at the government's Action Plan and its emphasis on community and landowner responsibility. The promotion of such a regionalised, multi-stakeholder management strategy has brought to light the diversity of values, ethics and understandings of wildlife that vague concepts like 'community' and 'public' often selectively ignore. Tensions between actors with differing perceptions of human-wildlife relations become particularly problematic in urban areas and where boar transgress borders between settlements, forest and agriculture.

Ultimately, this paper is about participation in decision-making, the complexity of local power relations, and the difficulties of assimilating diverse actors into shared management goals.

NEW METHODS FOR AGE-OLD QUESTIONS OF MAGNETIC SENSING IN WILD ANIMALS

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Keywords: Magnetic orientation, Compass, Biologging, Accelerometer, Magnetometer, Wild boar

Abstract: Evidence for the involvement of magnetic cues underlying animal orientation and navigation has been conclusively shown in a range of organisms, including animals belonging to five vertebrate classes and several invertebrate groups. However, the sensory receptors and biophysical mechanisms underlying magnetic responses are not fully understood. Furthermore, the functional significance of some forms of magnetic behavior, such as spontaneous magnetic alignment (SMA), in which animals align their body axis in fixed, non-random alignments with respect to the geomagnetic field, also remains a subject of debate. To date, the majority of studies investigating SMA have relied on field-based observational methods that are labor-intensive, restrictive in their sampling opportunities and lack experimental power.

Here we take advantage of the recent emergence of biologging technologies for studies of animal behavior and spatial cognition in free-roaming animals, including studies aimed to characterize the biophysical mechanisms and adaptive significance underlying SMA in wild animals. Specifically, we are investigating SMA in wild boar (*Sus scrofa*), which have been shown to exhibit magnetic alignment behavior, by using tri-axial accelerometer and magnetometer biologgers attached to free-roaming boar. Accelerometer and magnetometer profiles are time-synced with ground-truth video records and used to create machine learning classifiers that can identify natural behaviors in raw, unseen data collected from wild individuals. Furthermore, analysis of time-stamped magnetometer data provide a continuous record of the magnetic heading of tagged individuals. These data are then combined to create a 'magnetic ethogram' used to identify the magnetic orientation of pre-selected and ecologically relevant behaviors in wild boar without the need for direct observation.

In addition, we have successfully integrated these biologging sensors and machine learning techniques with high-resolution GPS transmitters, creating low profile, multi-sensor collars capable of collecting spatiotemporal behavioral data from wild animals. Not only will the continued development of these technologies revolutionize studies of SMA in wild boar, but will offer new opportunities to investigate a range of important biological topics, including physiology, behavior, energetics, disease, and management across multiple spatiotemporal scales in domestic and free-roaming animals.

ASSESSING THE RANDOM ENCOUNTER MODEL RELIABILITY WITH WILD UNGULATES

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Abstract: The Random Encounter Model (REM) is a method based on camera-traps data for estimating wildlife population densities without individual recognition. Although there are a plethora of methodologies to estimate wildlife population densities, for some relevant and elusive species, e.g. wild boar, there is not a feasible and reliable method able to derive density values. In this context, the REM has a high potential to be used in multi-species and large-scale monitoring programs, due to its no-invasiveness and feasibility to achieve the sampling effort requested for monitoring elusive and rare species. Despite its potential, the number of field studies validating the density values derived from REM are scarce. Here, we have tested the reliability of the REM in a wild boar population and three red deer populations. The "gold standard" method considered are Distance Sampling (DS) and Spatial Mark-Resight (SMR). We have monitored red deer populations using nocturnal line transects (for DS application) and camera-traps (for REM). A wild boar population was twice sampled using linear transects (for DS – during one season) and different grids of camera traps (for SMR – during another season; and REM). Densities values varied between 10.3 and 29.2 ind/km^2 (DS estimates) in the red deer populations and between 5.1 and 11.6 ind/km^2 (SMR and DS estimates, respectively) in the two seasons of the wild boar population. Our results showed a strong correlation between REM estimates and those obtained with the gold standard methods (Pearson's r=0.94, n=5, p=0.01). In addition, results showed a high level of accuracy of the REM estimations when they were compared with those from the gold standard methods: no-significant differences (Wald tests, p>0.05) were found between paired methods. Our results are one of the first field evidence supporting the accuracy of REM estimations. In this respect, they are promising outcomes especially for wild boar monitoring, since a feasible method to estimate population density of this species is highly demanded worldwide by researchers and managers. Moreover, all the parameters related with the REM were estimated from the camera-trap data, enhancing the utility of the method. We hope that these results will promote more studies in order to get a stronger support for REM before its generalized implementation in wildlife monitoring programs, in general, and particularly for wild boar population monitoring.

SEASONAL AND SPATIAL VARIATION IN WILD BOAR MOVEMENT BEHAVIOUR: IMPLICATIONS FOR RANDOM ENCOUNTER MODEL

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Keywords: Activity, camera-traps, day range, density estimations, monitoring, *Sus scrofa*, travel speed.

Abstract: The Random Encounter Model (REM) allows for estimating wildlife population density based on camera-traps data without individual recognition. Day range (DR; i.e. daily distance traveled by an individual) is the most costly and time-consuming parameter for applying REM. Despite DR were traditionally estimated from telemetry data, several authors showed under-estimations using this technology mainly due to it assumes linear paths between consecutive fixes. According to these limitations, a new procedure for estimating DR with the information obtained with camera-trap was described. From camera-traps, DR is estimated as the product of travel speed (i.e. average speed while active) and activity level (i.e. proportion of day that the population spent active) taking into account the different behaviours of the animals while active (i.e. moving or feeding) to derive a weighted DR value. Applying this procedure, we have estimated DRs for wild boar populations and evaluated the seasonal and spatial variation. For studying spatial variation, six Spanish wild boar populations were sampled with camera-traps during one month in summer (season less availability of resources). For the seasonal variation, three of them were also sampled in spring (season with high availability of resources). Our results show spatial (but no seasonal) variation in DRs. Significant differences in the time spend in movements (moving activity) among populations were found. These results could be explained by thinking in a different distribution of resources between populations. In heterogeneous environments, animals need to move continually to find resources; while in homogeneous habitats, animals can satisfy their nutritional need without traveling long distances. In the seasonal comparisons, all populations showed greater (but not significant) values of activity in summer, suggesting that wild boar spent more time feeding (feeding activity) in the season of lower availability of resources. Overall, we can conclude that the travel speed of wild boar is consistent between seasons and across spatial gradients, and the spatial variation in DR is mainly due to variations in the population activity. Thus, the effort required to apply REM could be substantially reduced since the effort to derive DR values for new wild boar populations is reduced to characterize population activity. These results suppose a step forward as regards firmly establishing the REM as a core tool for wildlife monitoring.

COMPARISON OF THREE METHODS TO ASSESS THE POTENTIAL FOR BUSHPIG-DOMESTIC PIG INTERACTIONS AT THE LIVESTOCK-WILDLIFE INTERFACE IN UGANDA

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Keywords: *Potamochoerus*, interactions, African swine fever, domestic pigs, crops

Abstract: Bushpigs (*Potamochoerus larvatus*) are a nuisance to farmers because of their crop raiding habits. Through their incursions into farmlands, they may interact with free-ranging domestic pigs and potentially cause transmission of infectious diseases such as African Swine Fever (ASF). The role of the bushpig in the epidemiology of ASF is poorly known and one of the gaps of knowledge is precisely the nature of interaction between bushpigs and domestic pigs. In this study, we investigated the frequency of bushpig visits to crop fields in rural communities where ASF is endemic, at the edge of a wildlife protected area (Murchison Falls National Park) in northwestern Uganda, comparing three methods (questionnaires, observations for tracks, and Camera traps) concurrently, in 28 farms during wet and dry seasons. The results obtained were analyzed by generalized linear mixed models. Potential risk factors including crop type, season and landscape characteristics were tested as explanatory variables. A general linear model and the Kendall test were used to compare the results and consistency of the frequency values obtained by the three methods. A high percentage (75%) of interviewed farmers reported visits from bushpigs in 29.6% of assessed crops (n=145), whereas a frequency of 0.014 +/- 0.05 visits per night was obtained through camera-trapping. Bushpig tracks were detected in 36% of sessions of observation. Cassava (*Manihot esculenta*) and groundnut (*Arachis hypogaea* L.) gardens were the most visited, and more common during the rainy season. Distances from crop sites to the boundary of the protected area and to the river also influenced visit frequency. Camera-trapping was the least sensitive method while questionnaires and track observations presented consistent and complementary results to characterize spatial and temporal visits of bushpig into the crop fields. Evidence form our study shows that when used in combination, these methods can provide useful data to improve our understanding of the interactions between bushpigs and domestic pigs at the domestic-wildlife interface.

SPATIAL EPIDEMIOLOGY OF AFRICAN SWINE FEVER (ASF) IN WILD BOAR

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Abstract: Host abundance, movements, and landscape structure often interact to shape spatial patterns of many wildlife diseases. African Swine Fever (ASF), a devastating disease of wild and domestic suids, has been spreading among wild boar in eastern Europe for a decade now which raises questions on the factors underlying spatio-temporal ASF dynamics in this novel host-pathogen system. We evaluated factors shaping ASF occurrence and spread in wild boar during the first three years (2014-2016) of the ASF epidemic in Poland using infectious status of 698 wild boar samples.

First, we examined whether monthly parameters of wild boar movements (home range size and dispersal) can explain variation in the spatio-temporal dynamics of the ASF outbreak. We expected to observe a positive relationship between host mobility and disease spread but, contrary to our expectations, we found that movements of wild boar were poor predictors of ASF dynamics in space and time. We believe that severity of the disease, which quickly hampers extensive movements and restricts disease transmission to only the most immediate individuals, limits the influence of host movements on ASF spread. Wild boar social structure, the short duration of low-level virus shedding, and high virus-induced lethality most likely shape the gradual spread of ASF in space, estimated at 1.5 km/month in our study.

Second, we examined the effects of wild boar density, proportion of forested area, human activity, and proximity to previous outbreaks on ASF occurrence. We found that the probability of ASF occurrence increased from 7 to 51% as population density rose from 0.4 to 2.9 ind/km^2. The positive effect of population density on ASF occurrence was stronger at locations near previous ASF incidents. ASF was more likely to occur in forested areas, with the probability of detecting an ASF positive sample rising from 4 to 32% as forest cover around the sample increased from 3.6 to 99.9%. This pattern was consistently relevant both at low and high wild boar densities. Indicators of human activity were poor predictors of ASF occurrence. Our findings suggest that disease control efforts should be focused on high-density populations and large forested areas. The intensity of control measures should decrease with distance from the infected area to match the observed spatial pattern of ASF occurrence probability.

MANAGEMENT AND RESEARCH OF WILD BOAR IN SLOVENIA: SITUATION, BASIC PRINCIPLES, CHALLENGES AND PERSPECTIVES

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Abstract: In Slovenia, wild boar (*Sus scrofa*) is a native species, which was exterminated in the 19th century but reintroduced in 1913. Since then, the species has been facing continual increasing trend both in numbers and in spatial distribution. For example, the annual cull of wild boar has increased by 30-folds in five decades, i.e. from 406 individuals in 1970 to 12,241 in 2017, respectively.

Since 1970s, populations of wild boar as well as of other wild ungulates have been managed adaptively. Such management does not rely on population estimates, and no efforts for assessing population numbers have been made for decades. However, recent estimation based on habitat modelling indicated that nowadays wild boar inhabits 73% of the Slovene surface, but it will increase its range to >90% of Slovenia till 2040.

Increase of the abundance of wild boar has many pros and cons for both environment and society, and wildlife managers are nowadays facing several challenges. The most important is to embrace wild boar (as well as all other native wild ungulates) as keystone species in forest-dominated landscape, and to understand their ecological role holistically. Indeed, as they have many important ecosystem functions their presence should be understood as an opportunity rather than a nuisance, risk-inducing factor etc. As perquisite for achieving this, the main conflicts with humans, which jeopardize sustainable management of populations and negatively influence public attitudes towards wild boar, should be overcome. In this respect, the main issues in Slovenia are as follows: (i) damages in agriculture land; (ii) wild boar-vehicle collisions and traffic-related mortality. Since 1 January 2010 (till 31 July 2018), 874 wild boar have been road-killed (75–143 per year), and 178 have been train-killed (9–36 per year), with several massive kill (up to 15 victims in a single collision). However, contrary to many other European countries, wild boar have so far not caused any conflicts neither as a vector/reservoir of diseases nor due to invading urban habitats.

To obtain new knowledge on general ecology of the species, its life-history traits and possibilities for reducing conflicts with humans, researches on wild boar have been recently intensified in Slovenia. By presenting selected case studies, the importance and the applicability of a large-scale, unique Slovene hunting information system will be highlighted, and possibilities for its better utilization will be discussed.

ACTIVITY PATTERNS AND RESOURCE SELECTION OF WILD BOAR IN A LARGE-SCALE PROTECTED AREA IN NORTHERN GERMANY

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Keywords: activity patterns, biosphere reserve, northern Germany, resource selection probability function, wild boar

Abstract: Developing and implementing efficient management and damage prevention measures for wild boar requires solid information on their spatio-temporal activity patterns and habitat preferences. This accounts especially for protected areas such as the UNESCO Biosphere Reserves (BR) Schaalsee in northern Germany. The BR Schaalsee comprises strictly protected nature reserves with prohibited access in the core zone on the one hand and intensive agricultural activities in the transition zone on the other – places where conservation purposes and agricultural interests sometimes collide. We use camera traps (remote cameras) to investigate population-level activity patterns and landscape-level resource selection of wild boar populations within the bounderies of the BR. Using ArcMap we placed a grid of 53 cells (4x4 km) over the area of the BR (~31.000 ha). Within each grid cell we set up one camera trap at a location where signs of wildlife presence (trails, resting sites, rub trees, damages to crops or grassland etc.) could be found. Remote cameras were installed in June 2018 and will remain on site for one year resulting in approx. 20.000 camera trap days in total. From this data wild boar activity patterns will be quantified and differences between single camera trap locations (small scale) and between zones (core, buffer, transition) of the BR (large scale) will be examined. For the evaluation of resource selection a logistic binomial regression model including a variety of potentially relevant independent variables (e.g. temperature, season, precipitation, distances to human settlements / roads / water bodies / forest edges, landscape features / composition, hunting events etc.) will be calculated. We expect wild boar activity to be primarily nocturnal but with differences between zones of the BR due to different levels of anthropogenic activity, hunting pressure and environmental / seasonal changes. Regarding resource selection influencing factors will be subject for analysis. We present our study design and preliminary results of this first study of its kind for a German Biosphere Reserve.

TESTING AN EXCLUSION FENCE TO PREVENT DAMAGE CAUSED BY WILD BOAR TO BIRD POPULATIONS IN A WETLAND AREA

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Keywords: wild boar, damage, exclusion fence, biodiversity conservation, bird

Abstract: Until the start of 2000, the Tec lagoon in an Integral Reserve of the Natural Park Aiguamolls de l'Empordà (Catalonia, NE Spain) was home to a colony of Purple Herons (*Ardea purpurea*), a pair of Marsh Harriers (*Circus aeruginosus*) and a Booming Bittern (*Botaurus stellaris*). It was one of the most productive areas in the Natural Park until wild boar (*Sus scrofa*) and American mink (*Neovison vison*) begun to use the area and bird nesting was no longer detected. In 2016, an exclusion fence was installed to protect a bird breeding sector from predation by wild boar and carnivores and trampling by cattle. This fence encloses a one-kilometre perimeter and consists of a torsion galvanised mesh of progressive density (2-m high) buried 30 cm underground to prevent wild boar from entering. A reinforcement of welded mesh (19x19 mm mesh size and 1.5 m high), with a cantilever inclined at the top, was also installed to keep American mink out. The enclosure is also equipped with an electric wire located on the top of the mesh to hamper the access of this carnivore and to avoid damage to the enclosure by horses and donkeys.

Since July 2016, eleven visits have been undertaken to monitor the effectiveness of the fence. The entire perimeter was inspected in each visit to register openings or breaks in the fence and look for wildlife tracks and faeces that were recorded and geolocalized.

Several mammal species were detected in the surroundings of the enclosure: wild boar (*Sus scrofa*), fallow deer (*Dama dama*), fox (*Vulpes vulpes*), badger (*Meles meles*), otter (*Lutra lutra*), beech marten (*Martes foina*) and genet (*Genetta genetta*). American mink (*Neovison vison*) was not detected during the inspections.

The fence has remained intact during the two-year monitoring period, and even though wild boar rooting was detected at the bottom exterior part of the mesh on several occasions, the species have not managed to raise the fence or enter the enclosure. On April 2018, a marsh harrier (*Circus aeruginosus*) was reported to be nesting inside the enclosed area. Little egret (*Egretta garzetta*) were detected, although nesting was not verified.

The exclusion fence has proved effective to avoid wild boar damage and is a useful tool for nesting wetland areas management. Nevertheless, appropriate maintenance works must be programmed and the thickness of the wire reinforcing mesh must be selected according to local factors, such as the presence of flooded areas that may cause corrosion.

CATALAN WILD BOAR MONITORING PROGRAMME: LESSONS LEARNED AFTER 20 YEARS

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Abstract: Wild boar hunted in Catalonia (NE Spain) increased from circa 6,000 individuals in 1990/91 to 54,000 in the 2016/17 hunting periods. A Wild Boar Monitoring Programme (WBMP) was established in 1998/99 to register the wild boar population and hunting pressure trends. The WBMP is coordinated by the hunting administration in the Catalan Government and the regional administration Diputació de Barcelona. Currently, it is applied in 22 areas called 'observatories' in diverse geographical zones such as coastal Mediterranean mountains, Pyrenean areas, or continental cultivated flat areas. Twenty-one technical and circa 153 hunter teams are involved in data gathering. For each battue carried out in a hunting area, the date, location, number of hunters, number of dogs that participated, number of wild boar captured, their sex and weight, and the number of individuals that escaped are registered. In 2017, the WBMP database included information from 69,886 battues and 145,202 wild boar hunted.

Monitoring indicators calculated every year in each 'observatory area' are i) related to hunting pressure: number of battues carried out per surface unit, mean number of hunters and dogs that participated in the battues; ii) related to wild boar: mean number of wild boar hunted and observed per battue and per surface unit, density estimation, sex ratio, and weight distribution.

During the monitoring period, wild boar densities increased in all the monitored areas. Nevertheless, strong asymmetries between areas were observed. The highest wild boar densities and growth rates are registered in the North-Eastern study area showing a relationship with factors related to food availability: high annual rainfall, oaks and beach forest and acorn crop surface. The influence of feral pigs released in natural areas is considered a factor contributing to the particularly sharp increases in population rates registered in some areas.

Despite the enlargement of the hunting period, the mean number of battues per surface show only slight increases or stability, depending on the areas. The same trend is shown by the number of hunters participating in the battues.

Wild boar hunting is the main cause of mortality of the species and it is considered crucial for wild boar population control. Nevertheless, high food availability favoured by wild boar habituation to crops and other humanised areas requires a broader approach in the control management strategy.

ASSESSING AGRICULTURAL DAMAGE BY WILD BOAR USING DRONES

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Keywords: Belgium, crop damage, GEOBIA, Geographic Object-Based Image Analysis, UAV, wildlife damage

Abstract: In Flanders (northern Belgium), wild boar (*Sus scrofa* L.) returned in 2006 after more than 50 years of absence. Since the recolonisation, the population has been increasing, both in numbers and in geographic extent. During its absence, Flanders' landscape structure changed into a dense, mosaic-like pattern of agricultural, natural and urban areas. The return of the wild boar increasingly leads to human-wildlife conflicts, mainly linked to damage in agriculture. Hence, there is a growing need for a time-efficient, standardized and accurate method to assess crop damage. We present a dorne based method, using Geographic Object-Based Image Analysis (GEOBIA) and Random Forests to calculate the damaged area and associated yield losses in individual fields. Our approach resulted in a 84.50% overall accuracy in calculating damaged area for maize fields, and 94.40% for grasslands. Damage levels ranged between 14.3% and 20.2% in maize fields and between 16.5% to 25.4% in grasslands. Our method can provide objective base data for a compensation schemes and can guide impact management strategies based on damage assessments.

LANDSCAPE GENETIC ANALYSIS OF WILD BOAR IN A HIGHLY FRAGMENTED LANDSCAPE

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Keywords: Single Nucleotide Polymorphism, recolonisation, fragmentation, expansion, Belgium

Abstract: The wild boar is currently one of the most widespread mammal of the world and in many regions populations keep expanding. In eastern Flanders (northern Belgium), the wild boar has returned since 2006 after almost half a century of absence and numbers are increasing. The Flemish landscape is severely fragmented and is one of the most densely populated areas in the world. Understanding the relationship between landscape structures and species biology is the basis of landscape ecology and leads to the understanding of factors driving wild boar recolonisation and expansion. We therefor assessed the evolution of population structure during the recolonisation and conducted a landscape genetic study to gain knowledge on drivers of wild boar expansion in the fragmented Flemish landscape. A total of 838 DNA-samples collected from wild boar shot between 2007 and 2016 were genotyped for 140 single nucleotide polymorphisms (SNPs). Our results showed that the wild boar population expanded in eastern Flanders starting from 2 local gene pools while staying largely genetically distinct with some admixture and geographically separated. A third gene pool emerged around 2013 in the northwest coming from the Netherlands and Germany. Landscape genetic analysis revealed that the spatial genetic pattern was mainly driven by isolation by distance and forest cover. The higher the latter, the lower genetic distances seemed to become. To a lesser extent, increasing road density, low natural coverage and habitat patch density resulted in increasing genetic distances while increasing mean habitat patch sizes resulted in decreasing genetic distances. Gaining this knowledge of factors driving expansion and the inhibiting effect of fragmentation during recolonisation is essential for the analysis of future dispersal. Analysis of future dispersal can now be conducted and form the basis of a risk assessment of future wild boar expansion which is urgently needed in Flanders as human-wildlife conflicts with wild boar increase.

ISLAND POPULATION GENETICS: THE CASE OF WILD BOAR IN SARDINIA AND ITS SATELLITE ISLANDS

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Keywords: wild boar, introgression, Sardinia, hybridization, wildlife introductions

Abstract: Given its position and history, Sardinia has been an open-air evolutionary laboratory for many mammal species, influenced by genetic drift, local adaptation and human intervention.

An emblematic case is the wild boar, an iconic game species introduced to the island since early Neolithic. Escaped from human control, the wild boar gradually started to diverge by all other continental wild and domestic populations, to the point that today it is classified as a distinct subspecies (*Sus scrofa meridionalis*), despite crossbreeding with domestic pigs (currently free-ranging in some inner areas) and, more recently, with illegally introduced exotic wild boar.

With the aim to reconstruct the puzzling history of Sardinian wild boar and its genetic make-up, we analysed wild boar from throughout the main island and three small satellite islands, hosting populations of unknown origins. An array of genetic markers (SNPs, autosomal and Y-chromosome STRs, CR-mtDNA, and two nuclear genes) and several reference populations from all over Europe were used to evaluate the status, genetic structure, admixture level and origin of the Sardinian population.

Overall, our data indicate that the Sardinian wild boar has an ancient origin in the Italian peninsula, but it is currently genetically very different from all the other domestic and wild European populations. The employed markers revealed different introgression levels from domestic pigs and exotic wild boar in different areas of Sardinia. In fact, the presence of a clear genetic structure (with three subpopulations occurring in the main island), due to the effect of landscape features and artificial barriers, has been preventing the spread of introgression in the two subpopulations occurring in the western area. Additionally, the genetic make-up of the three minor island populations was found to diverge from that of Sardinia to such an extent that they could not be classified as Sardinian wild boar. In fact, their genome bore traces of multiple introductions from different source populations, as well as introgression from the domestic pig, followed by genetic drift.

In conclusion, wild boar in Sardinia and in its minor islands revealed a mosaic of pure and extensively introgressed populations. The species' management deserves appropriate information-based actions to preserve the peculiar genetic traits of the purest demes, while contrasting the invasive admixed stocks in other areas and in the minor islands.

THE USE OF HUNTING DOGS FOR HUNTING WILD UNGULATES (*SUS SCROFA USSURICUS, ALCES ALCES CAMELOIDES, CERVUS ELAPHUS XANTHOPYGUS, CAPREOLUS PYGARGUS PALLAS*) ON THE HUNTING GROUNDS IN SIBERIA AND FAR EAST OF RUSSIA

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Keywords: Siberia, Amur region, hunting, hunting dogs, Ussuri boar, Siberian roe deer, red deer, elk

Abstract: Practical research on the use of two main breeds of Eskimo or Laika dogs (West Siberian and East Siberian breeds) were conducted while hunting wild ungulates in Siberia and Far East of Russia. The most common method to hunt wild ungulates in Eastern Siberia and Amur region is hunting for wild boar with dogs. A group of hunters, usually consisting of two or more people (in Amur region it is no more than eight), is divided into riflemen and beaters. The hunters are usually chosen among those who know well the local terrain and can easily orient on hunting grounds, as well as the youngest and most physically fit, able to walk for more than a mile on deep snow or fallen bushes and trees. Their task is to drive the animals out onto the shooting line as correctly as possible, while it is important that the beaters themselves frequently extract the animals from under the dogs. It is quite often that hunters who specialize in wild boar hunting own 2 to 10 hunting dogs. This type of hunting often leads to dog injuries. Hunters walking along a wild boar's typical habitat find a fresh trace of a group of boars. Most often they are individual animals of different sex and age, ranging from 8 to 12 individuals in smaller groups and 15 to 35 in large groups, and, rarely up to 45 individuals in one group, where 50 to 60% of them are young. After locating a group of animals the hunters release the dogs on the trail. In Amur region hunters use West Siberian Eskimo or Laika dogs when hunting Siberian roe deer. Dogs with strong endurance and maliciousness are needed to hunt the Ussuri red deer, because they are supposed to quickly catch the red deer on a stone rock and hold it for a long time, sometimes even for 8-10 hours. We recorded cases of dogs holding an animal for 24 hours. When hunting elks, husky dogs behave differently, responding to its other characteristic qualities. Possessing malice and assertiveness in hunting for an elk, the dog is almost immediately subject to death. Elks most commonly leave hunters without their best helpers in the hunt, allowing no mistakes from unexperienced dogs during their work. This is especially characteristic for the northern areas of the region where snow cover exceeds the average long-term indicators of 30-40 cm.

LOCAL WILD BOAR (*SUS SCROFA* L.) HUNTING BAG DYNAMICS AND THEIR INFLUENCING FACTORS IN THE PALATINATE FOREST-NORTH VOSGES BIOSPHERE RESERVE. WHICH FACTORS INFLUENCE THE POPULATION DYNAMICS?

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Keywords: forest, population dynamics, supplemental feeding, wild boar

Abstract: The examination of wild boar hunting bags on 71 000 ha state forest in the Franco-German border region Palatinate Forest-North Vosges (41 000 ha of state forest in the Palatinate Forest and 35 000 ha in the North Vosges), a homogeneous and mostly closed forest, showed differences between both sides of the border. The hunting bags in France were about 3 times higher than in Germany (6.8 wild boars in the North Vosges to 1.9 wild boars in the Palatinate Forest per 100 ha and year; from 2006 to 2016; without game killed by disease or accidents).
Due to similar conditions, for example an equal percentage of mast producing species (beech and oak) in both areas (53% - 54%) and a mean January temperature between 1.4°C and 1.7°C, rather the hunting approach should explain the different hunting bags. Especially the feeding quantities vary and is higher in France (10 kg per day and 100 ha in the North Vosges to 0.6 kg per day and 100 ha in the Palatinate Forest). Distinctive hunting pressure or age and gender differences in the hunting bags were not apparent but couldn't be examined in detail. Therefore our conjecture is that the feeding practice is accountable for the higher hunting bags in France. If this is true, in times while the African swine fever expands through Europe, French hunters and lawmakers should reduce their feeding quantities too.

MONITORING WILD BOAR WITH THERMAL NIGHT VISION GOGGLES

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Abstract: Background: Wild boar is one of the widespread mammals in Northern Israel, that protected by the law. In the last decades, it seems that there is a large increase of wild boar populations, especially inside and adjacent to agriculture fields and villages. Regulating of these populations, were dune by permission to hunt them in the agriculture region. Monitoring the wild boar were done by projector transects and camera traps to estimate the status and the occupancy of the population. Unfortunately, these methods were not very useful, since the distance of identifying and discovery was too short, so until now we have no any efficiency method to estimate the population size before and after managing activities.

Methods: In 2014 we start monitoring wild boar populations with night vision goggles (CORAL, Hand-held, 3-5 µm Thermal Imaging Binocular Camera), using point count method at the summer season. In each region we scan area of up to 2800 ha from 3-4 points, at the begging of the night. The scanning in each point occur about 20-30 min. We succeed to recognize wild boar from distance of up to 4 km that was in line of sight.

Results: In this method we succeed to survey and count most of the wild boar families that was in foraging in this region. We found in each year 87±6.5 individuals in 2800 ha, which divided to 52% adults and 48% juveniles.

Discussion: This method gives us opportunity to estimate the dynamic of wild boar population in open habitats (out of forest and orchards), and to have feedback for managing activities.

PREVENTION OF WILD BOAR DAMAGE IN AGRICULTURE

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Abstract: Wild boar can cause massive damage to agriculture. In Switzerland wild boar get a big part of their food from cropland. Free access to such high energy resource leads to population growth and as a consequence to more damage. A lot of effort is invested in top down regulation. However, despite high hunting pressure damage increases. To get out of this vicious cycle it is important to pursue a bottom up approach and limit the access to the high energy food source on agriculture fields. There exist various methods to limit wild boar the free access to crop. We investigated three methods; electric fence, shot to scare and acoustic deterrent. We measured not only the amount of damage before and after the prevention methods were applied but we also analysed the spatial behaviour of GPS-collared boars when they were confronted to these prevention methods. We show that damage prevention works when it is done accurate. Hunting pressure increases the success of the prevention methods because animals are more cautious. The cultivation of alternative crops that are not appreciated by wild boar may be an additional measure to take. We conclude that damage prevention should be part of a sustainable wild boar management.

AFRICAN SWINE FEVER IN WILD BOAR IN THE CZECH REPUBLIC

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Keywords: African swine fever, wild boar, eradication, infection disease

Abstract: The first case of African swine fever (ASF) in wild boar population was confirmed in the Czech Republic on 26th June 2017 in two wild boar found dead in the cadastral district Příluky u Zlína. As of 3rd April 2018 200 cases of ASF have been registered among wild boar found dead in the district Zlín. With the exception of 10 cases found outside the fences all the other cases have been recorded in the high risk area (inside the fences). Nearly 80 percent from 245 dead found wild boar in the high risk area have been positive. 99 dead found wild boar have been tested from the infected area outside the fences. 101 dead found wild boar have been tested from further districts of Zlín region outside the infected area - all with negative result. In total 648 wild boar were shot or trapped in the so called red zone till 31st January 2018. 17 animals from this group were ASF positive. 1874 wild boar were shot in the so called green zone in the same period. All tests from this group were negative.
Since 1st February 2018 infected area has been reduced. 287 wild boar were hunted in the new infected area till 3rd April 2018. Only one positive case was recorded from this group. In total 14 884 wild boar were hunted in the area of intensified hunting established 13th July 2017 till 3rd April 2018 – the highest number in the districts Uherské Hradiště (2 809) and Kroměříž (2 503). No positive case of ASF has been recorded in this area.
Infected area was established in the district Zlín immediately after confirmation of the first ASF case including hunting ban. Later on exception from the hunting ban has been allowed but only for approved hunters attending training on biosecurity rules during hunting and transport of hunted animals for ensuring disease spreading prevention. However only individual hunting has been allowed after obtaining sufficient data on disease spreading, it means at first in the low risk area approximately a month after the first findings and since September 2017 also in the high risk area. All wild boar hunted in the infected area have to be safely disposed in rendering plants and tested for ASF. 2809 wild boar were hunted in the infected area till 3rd April. 18 wild boar from this group were ASF positive. To support hunting in the infected area 3000 CZK were paid to hunters for wild boar till 50 kg of weight and 4000 CZK over 50 kg of weight in 2017. In 2018 payment increased to 4000 CZK and 8000 CZK. Another compensation is paid to hunters from the Ministry of Agriculture according to the Veterinary act for wild boar which cannot be used as a venison and have to be safely disposed in rendering plants.
So called buffer zone has been established around the infected area within the area of intensified hunting. Hunting in this area was supported with 1000 CZK in 2017 for each shot wild boar. In 2018 support increased to 2000 CZK. All hunted boar have to be tested for ASF. The passive surveillance in the area of intensified hunting – finding of dead wild boar and its testing has been generally accepted as one of the most important steps among the approved measures. It is more important to collect carcases than hunt. From this reason 3000 CZK are paid for each wild boar found dead.
From 16. 10. 2017 after two weeks with no positive finding in carcases, at the end of epidemic phase, hunting of wild boar in the infected area by snipers from Police started.

Hunted in total 157 wild boar and 8 of them were positive for ASF. Snipers were trained for wild boars hunting and for biosecurity during hunting. Police snipers were employed for high risk zone. They were split in 8 teams of two men shooting wild boar at three days interval. All shot wild boar were collected by State veterinary administration, safely transported to the nearest road and then sampled at the rendering plant.

ASF is 1 year after the first case still located on a very small territory and it is not spreading due to combination of whole set of measures taken and continuously adjusted to the development of disease situation. State Veterinary Administration (SVA) closely collaborate with many subjects (regional government, municipalities, farmers, hunters organizations etc.). Installation of smell and electric fences, non-harvesting of some fields in the high risk infected area could be taken as an example of other measures taken.

SVA issued several extraordinary veterinary measures to prevent spreading and enable disease eradication. Feeding of wild boar is forbidden on the whole territory of the Czech Republic with the exception of baiting for hunting.

At the same time the SVA focused to the prevention on ASF introduction to domestic pig's population. Since July 2017 extraordinary official controls of holdings targeted on biosecurity have been done. To increase biosecurity and avoid contact between wild boar and domestic pigs is one of the main duties ordered in the infected area. Movement of pigs is allowed only after approval of the SVA. It is also forbidden to use straw and grass as a feed, to feed cereals from the last harvest from the infected area. It is ordered to keep pigs inside stables and use special working clothing and shoes. Awareness on necessity to follow strong biosecurity in pig holdings was repeatedly mentioned at various occasions (information campaign, leaflets, methodological instruction, webpage SVA www.svscr.cz). The ban on keeping pigs in non-registered holdings (one pig for home slaughter - own consumption) has been indorsed in the high risk area. Municipalities in the whole region Zlín had to perform census of all pig holdings till the end of January 2018. Duty to check all pig movements, system of early detection, regular visits and checks by veterinary inspectors and system of testing of sick/dead animals in pig holdings also contribute to minimize risk of ASF spread.

Finally we can summarize experience with eradication of focal outbreak of ASF in wild boar. The key role for early detection system and for effective measures play passive surveillance, collection and testing of death wild boar. After confirmation of the disease is necessary to define infected area based on passive surveillance. Because at the beginning we missed information about infected area and exact wild boar population the infected area is bigger. Must be finalize according to passive surveillance. Stop of hunting and feeding during epidemic phase of infection is effective measures to prevent spreading of ASF. Hunting is applicable at the final stage of the epidemic phase after setting infected area and biological safety during hunting. Intensive targeted hunting by trained person seems to be very effective method for decreasing of population at the end of epidemic phase. Active searching of carcases in the infected area after decreasing of population and crop harvesting is very important because carcases can be source of infection for long time. Very important is communication among all stakeholders. In infected and high risk area is necessary to impose preventive measures in domestic pigs. Measures are focused mainly on biosecurity in farm, mainly in backyard farms.

GENETIC STRUCTURE OF WILD BOAR (*SUS SCROFA*) POPULATION FROM POLAND BASED ON MICROSATELLITE LOCI ANALYSES

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Abstract: The wild boar (*Sus scrofa* L.) inhabits the largest area of all species of the family *Suidae* and is one of the most widespread native mammal species. In Poland, it is the most abundant game species. The aim of the study was to demonstrate the influence of the environment on the migration and occurrence of three wild boar populations in Poland. The analysis involved: phylogenetic differences between the wild boar populations in the three regions of Poland, genetic variation between the populations, degree of genetic isolation, possibility of gene transfer.

The analysis involved wild boars from the Lublin region, Warmia and Mazury, and Wielkopolska. The study material comprised muscle tissue samples collected from 100 wild boars. The analysis was subjected to loci: S0008, SW1129, SW986, SW1465, SW1492, SW1514, SW2532, SW461, SW841, SW2021, and SW2496. The largest number of specific alleles, i.e. in six loci, was observed in wild boars from Warmia and Mazury; in turn, there were only two alleles in the group of wild boars from Lublin, and no alleles in individuals from Wielkopolska. The average value of the observed heterozygosity was $H_o = 0.51$, and the average value of expected heterozygosity was $H_e = 0.63$. PIC was another analysed indicator, with its lowest value determined for wild boars from the Wielkopolska region (0.53), and the highest value (0.62) was found for the animals from Warmia and Mazury. In the study population of wild boars, we also determined the F_{ST} index, which was 0.073, and N_m had a value greater than 3 (3.15); therefore, it can be concluded that the number of migrants per generation was 3. Both coefficients confirm the possibility of gene transfer and reproduction within and between the analysed populations of the wild boars. In our study, we observed a greater genetic distance between the wild boar populations from Wielkopolska and the Lublin and Warmia and Mazury regions in spite of the smaller geographical distance of these lands. This may be caused the less extensive network of ecological corridors as well as the occurrence of anthropogenic barriers e.g. large urban centres, an extensive network of roads, and the high volume of traffic in the direction of the capital.

JAPAN GIBIER: WILD MEAT PROMOTION AND AGRICULTURAL DAMAGE MANAGEMENT

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Abstract: Japan is believed to be facing the world's biggest challenge of an aging society. The population is also rapidly declining, especially in rural areas. In agricultural villages in general, the aging rate (ratio of population over the age of 65) exceeds 40%, and manpower to keep society is starting to run short. In these communities, there is conflict with wild animals, and wildlife damage to crops and agricultural land is becoming a social problem. Agricultural damage has continued to be 20 billion yen annually since 1999. The Japanese government, along with local governments, provides policy and financial support for the continuance of agriculture, forestry, local communities, and conservation of the environment. Over 10 billion yen has been spent annually since the financial year 2011 on countermeasures for agricultural damage alone. Countermeasures include the protection of farmland, maintenance of abandoned farmland adjacent to agricultural land, formation of buffer zones by forest maintenance, and population control of pest animals. Sika deer (*Cervus nippon*) and wild boar (*Sus scrofa*) are the main targets of the government's population control goal, which is to halve these numbers by 2023, from the estimated numbers in 2013. If this plan is successful, the number of deer will reduce from 3.15 million to 1.6 million and wild boar from 800,000 to 500,000. In addition to this plan, a policy to promote the utilization of the meat of captured animals has begun. We will call this Japan Gibier, and its main purpose is "Creating the vitality of the local community." The government has announced that it will make efforts to utilize wild animal meat, which will accelerate the use of wild animal meat in restaurants, retail sales, promotion of tourism, and expansion of pet food sales, and as provision for school meals. The government also aims to double meat usage from 1,000 to 2000 tons (665 tons of deer meat, 343 tons of boar meat) and intends to reduce agricultural damage by developing Japan Gibier. To contribute to these measures, I started to build a database of scientific information on the usage of Gibier. Here, we will examine the role of Japan population adjustment and Japan Gibier in reducing agricultural damage and its related effects.

THE PRESENCE OF WILD BOAR IN URBAN AREAS OF HUNGARY

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Keywords: wild boar, urban area, damage

Abstract: In the course of our research we analysed the appearance of wild boar in urban areas of Hungary. We examined the phenomenon spatiotemporally and used two different methods to classify damage characteristics. The first method was a keyword search executed on various web platforms (17,800 searches with Google, 56 regional news pages, and the database of Hungarian News Agency). We inspected the search results and collected information about the problem. Secondly, we used a questionnaire surveMay covering 262 cities in 15 counties, and 17 settlements in the Lake Balaton region. We analysed 164 different web entries and 63 questionnaire responses (the efficiency was 20%). We used these results to build a database comprising the time and location of the wild boar appearance as well as the characteristics of the damage caused.

Our results showed that the presence of wild boar in urban areas is a real problem in Hungary. The first case occurred in 2000, and the number of cases remained low for a number of years afterward. However, the phenomenon has become commonplace since 2007, a fact supported by the increased number of web entries. The expansion of the problem showed regional features and only some isolated cases occurred. One of the most affected cities was Budapest with 25% of all web entries connected to this area. In addition to the capital, 87 settlements – half being cities, the other half villages – in 15 counties were affected. The three most affected areas were Pest county (the Danube Bend area, and the Pilis Mountains), Heves, and Borsod counties (region of the Mátra and Bükk mountains), and the Lake Balaton region. Damage characteristics varied. In most of cases, the damages occurred on city edges and in natural habitats. Moreover, linear landscape elements such as rivers, railways, and tree-lines played important roles regarding the appearance of wild boar in urban areas. Sometimes the wild boar visited the inner urban areas, typically during daytime. In total, the following 7 types of damages or threats were found: rooting in private gardens, frightening people, damaging fences, rooting in public domains, causing vehicle collisions, injuring dogs, and attacking humans.

A DESCRIPTION OF PRINCIPAL FORAGE CROPS USED FOR EXTRA NUTRITION OF WILD UNGULATES (*SUS SCROFA USSURICUS*, *ALCES ALCES CAMELOIDES*, *CERVUS ELAPHUS XANTHOPYGUS*, *CAPREOLUS PYGARGUS PALLAS*) IN SIBERIA AND THE FAR EAST OF RUSSIA

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Keywords: Siberia, Amur region, forage Crops, limiting factor, ussuri boar, Siberian roe deer, red deer, elk

Abstract: An analysis of feeding conditions of certain wild animal species allows hunting farms to properly plan additional nutrition during the year, thus maintaining animal population on certain hunting territories and minimizing animal migration to neighboring hunting territories. Forage shortage is a limiting factor, especially during difficult periods of the year, like winter or early spring. The results of current research allow hunting farms to use data on animal feeding preferences in different seasons of the year and to organize biotechnical activities for the purpose of improving feeding conditions of such wild animals as Ussuri boar, red deer, Ussuri elk and Siberian roe deer. The authors identified the most preferable, commonly eaten, minor fodders, as well as forages that are needed during difficult periods of animal life, so called "limiting feeding stuffs". We have been studying fodder conditions in Eastern Siberia and Amur region for 8 years. An analysis of excrement found in various areas of the Republic of Buryatia and Amur Region was made to determine ungulates ration. Food elements were identified physically by clearly seen fragments and by conventional lab tests. Our research results allow hunting farms to improve their systems of biotechnical and reproductive measures, in order to increase wild ungulates' population and to improve hunting grounds quality. The attendance frequency of such feeding fields by wild animals depends on their location, season of the year and the abundance of vegetation. As a rule, those feeding fields are being located at 1-2 km. distance from human settlements or forest and field roads due to materials' delivery logistics and machinery access. Feeding fields' sowing happens annually in different areas of hunting grounds. In the Republic of Buryatia, the territory of 109 hectares was sown in 2015, over 31 hectares - in 2016, and 62 hectares - in 2017; in Amur Region 1,000 hectares were sown in 2015, 655 hectares - in 2016, 517 hectares - in 2017. Hunting farms and game hunting reserves of both territories under study try to diversify feeding fields composition and alternate crops. The best forage crops for hoofed species are: alfalfa, rape, sweet clover, soybean, rye, vetch and other plants that contain large amounts of protein. Hay is produced annually for ungulates' extra nutrition. In the Republic of Buryatia 95.4 tons of hay were harvested in 2015, 47.7 tons - in 2016, 78.8 tons - in 2017. In Amur Region 67.2 tons of hay were harvested in 2015, 38.9 tons in - 2016, 70.7 tons - in 2017.

MANAGEMENT OF *SUS SCROFA* THROUGH OUTREACH EDUCATION AND PRIVATE CITIZEN ACTION: LESSONS FROM TEXAS

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Keywords: Texas, wild pigs, outreach, damage management

Abstract: Worldwide, wild boar and their domestic relatives pose concerns to agriculturalists, conservationists, and others. Since their introduction to present-day United States of America by Spanish explorers in the 1500s, wild pigs (*Sus scrofa*) fed, frustrated, and fascinated humans. We examined the history of interactions and perceptions of humans with wild pigs in Texas. Since the 1980s, both abundance and range of wild pigs has increased, as well as outreach education activities on control. Using the outreach education efforts of Texas A&M University's Wildlife Extension Unit as a model, we identified (1) growth of a recreational economy on feral swine hunting, (2) changing landowner goals and attitudes, and (3) a lack of a unified government policy to wild pigs as contributing factors to wild pig damage increase. Newer approaches to educating various publics as well as community planning, facilitated decision-making, and active control. We end with recommendations for proactively managing damage from swine from both grassroots (i.e. private citizen) and governmental organization actions, specifically for areas not yet far progressed in wild pig range and extent.

ANTIMICROBIAL RESISTANCE IN WILD BOAR IN EUROPE: PRESENT KNOWLEDGE AND FUTURE CHALLENGES

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Abstract: Antimicrobials are essential for the treatment of bacterial infections in humans and animals. However, their intensive use and misuse have severely increased the frequency of resistance among clinical and environmental bacteria, with progressively less effective therapies, and a post-antibiotic era is vaticinated. Antimicrobial resistance (AMR) has been recognized as an emerging, unparalleled and growing problem worldwide affecting humans, animals and the environment. As human populations grow and transform landscapes, contact with wildlife concurrently increases. Disease emergence is an important consequence of this acceleration in interaction, with the majority of emerging infectious diseases in humans now arising from wildlife reservoirs. Knowledge concerning AMR bacteria circulating in wildlife is currently limited, although the *wild compartment* could provide important insights into AMR emergence and persistence. Across Europe, wild boar (*Sus scrofa*) populations have dramatically increased their distribution and number over the last decades. Managing such expansion is challenging and will require the involvement of various disciplines. In the context of AMR dynamics, wild boar is the perfect model species to unveil the emergence, spread and persistence of AMR at the wildlife-livestock interface. Even though in Europe, investigations of the presence of antibiotic-resistant bacteria in wild boars are still in its infant steps, several studies have showed the potential role of this ungulate as important carrier and spreader of resistant bacteria. However, most of the studies are purely descriptive and a huge gap of information remains on the effects of anthropogenic activities (i.e. livestock and human density and farming management practices) on AMR prevalence and on the occurrence of antibiotic resistance genes in the gut microbiota of wildlife.
Following this line, future steps should ben taken to try to unveil the role of wild boar as reservoirs and amplifiers of AMR and the likely sources and mechanisms of persistence of AMR in this species. The mechanism by which the ecological landscape modulates the prevalence and transmission of AMR in the environment should also be explored. Such ecological framework is vital to identify and characterize transmission routes of AMR in wild boar.

The development of the wild boars abundance in the Czech Republic, and influence of wild boar on small game populations

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Keywords: count development, Czech Republic, environment, small game, wild boar

Abstract: Already Emperor Joseph II. In 1786 banned the breeding of wild boar in freedom, not only in the Czech Republic, but in the whole of Austria-Hungary, where wild boar could be hunted by everyone. This action has caused a strong reduction in the number of wild boar throughout Central Europe. After the First World War, the stock of wild boar in the Czech Republic was at its long-term minimum. Population growth began in the 1980s. Wild boar is currently the most commonly hunted hoofed game in the Czech Republic. In 2017, a record number of this game was captured, namely 230,035 (an average of 33pcs/1000 ha). In some areas, up to 86 pcs/1000 ha were caught. The increase in the catch of wild boars is more than a thousand times higher in the Czech Republic since the end of World War II. Today, we are predicting a decline in stock of wild boar due to the spread of African swine fever that occurred in the Czech Republic in 2017. The number of wild boars significantly affects small game species (brown hare, pheasant, rabbit, grey partridge) in the Czech Republic. The bigger catches of wild boar were in hunting grounds, the smaller the number (or catching) of small game there was found. Statistically significantly more (p <0.05) small game was counted in hunting grounds, where the wild boar were shot down to 20pcs/1000 ha. Conversely, the level of the catch of the wild boar did not have a negative effect on the catch rate of roe deer. The more wild boars were caught, the more roe deer were caught in the hunting ground. In hunting grounds where au to20 wild boars per 1000 ha were caught, significantly fewer (p <0.05) roe deer was caught than in other hunting grounds. On the contrary, in hunting grounds where more than 80 wild boars per 1000 ha were caught, significantly more roe deer were caught (p <0.05). When we analyzed the impact of the environment on the level of the wild boar catches, it was found that in hunting grounds with a proportion of farmed land up to 40% there were caught significantly more (p <0.05) wild boars than in hunting grounds with a larger proportion of farmland. On the other hand, in hunting grounds with forest representation up to 40%, significantly fewer (p <0.05) wild boars were caught, than in hunting grounds with a larger proportion of the forest. The greater the proportion of the forest was in hunting ground, the more wild boars were caught in it.

AFRICAN SWINE FEVER IN THE CZECH REPUBLIC: THE STORY OF ONE OUTBREAK

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Keywords: African swine fever, wild boar, Czech Republic, outbreak, epidemiology

Abstract: African swine fever was detected in the Czech Republic for the first time in June 2017. Until June 2018, more than 23,000 wild boar or domestic pig samples were tested for the ASF and up until now 248 wild boars have been positive for either the virus and/or the antibodies. The Czech isolates clustered with the p72 genotype II of the virus circulating in the Eastern Europe since its first emergence in Georgia in 2007. The infected area is located in the east of the country, about 25 km from the Slovak border. The nearest reported cases of ASF were located farther than 400 km at the time of outbreak emergence. Indirect transmission by human activity appears to be the most likely way of introduction to the Czech Republic. The standard measures, such as passive surveillance with payments for reported wild boar carcasses, hunting and feeding ban in the infected zone, ban on entry to the high-risk zone, motivated intensive hunting in the buffer zone, etc., were applied. Some crops were left unharvested to provide food and shelter for wild boar in order to keep them in the infected zone. Simultaneously, some alternative measures were applied, such as scent fences and electric fences around the infected area, trapping wild boars, and, since October 2017, also hunting of wild boars in the infected area by police snipers.

There were more than 520 wild boars inside the fenced area ($57km^2$) giving density of approx. 9.1 animals/km^2. More than 280 of these were found dead, and the disease prevalence in that group was 71,7%. The disease prevalence in wild boars hunted within the infected area was very low (5.1%). About 74% found dead wild boars and about 85% hunted wild boars (PART I. and II.) were tested for presence of specific antibodies. There were 16 hunted animals with presence of specific antibodies but without the ASF virus. These were survivors and their number (6.7%) is not insignificant. More than 17 000 wild boars were hunted and tested for ASF in the buffering zone within the active surveillance motivated with financial reward.

The disease spreads very slowly inside the territory, with an average speed of 0.5 km per month despite the high wild boar population density. The typical seasonal summer peak was noticed, and then a second rise of incidence in November–December that could be related to snipers hunting and beginning of wild boar rutting season. The obtained epidemiological data and efficiency of applied measures will be discussed.

MODELING THE WILD BOAR HUNTING EFFORT TO EXPLAIN THE RESULTING HARVEST, CASE OF A DRIVE HUNT IN FRANCE

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Abstract: European wild boar populations have strongly increased during the last decades. Hunting is considered today as the most efficient way to control the level of these populations. However, despite the large number of animals culled by hunters in France, there are still many local conflicts with stakeholders due to wild boar impacts on human activities (e.g., crop damage). Increasing the efficiency of hunting activity is therefore a timely issue. In our study, we first focus on the definition and the measurement of the hunting activity in terms of both "effort" and "pressure". The terms of "hunting effort" and "hunting pressure" are often used in ecology but without clear definition. Based on a literature review in the field of fisheries science, we define "hunting effort" as all the means implemented by hunters to practice their hunting activity, and "hunting pressure" the resulting mortality rate. We tackled the following question: how can the hunting effort be measured, and what is the relationship between effort and pressure? We used data describing the hunting bags of 361 drive hunts in Chateauvillain (North-eastern France) from 2009 to 2013 to answer this question. We designed a statistical model relating variables thought a priori to be good descriptors of the hunting effort (hunting effort variables such as the number of hunters participating to the hunt, the number of dogs, the perimeter of the hunting area, etc.) to the number of culled animals. We used a Bayesian method of variable selection to identify the relevant effort variables, i.e. those explaining the hunting bag. This approach revealed that the number of culled animals was higher when there were many posted hunters, when the hunted area was large, and when the hunt occurred before February. Our hunting effort model could be used by the local hunting manager to adjust his hunting effort in order to reach the expected hunting pressure to meet the expectations of its management plans.

MICROSATELLITE VARIABILITY IN WILD BOARS FROM CZECH REPUBLIC

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Keywords: genetic diversity, population structure, *Sus scrofa*

Abstract: The wild boar (*Sus scrofa*) is one of the most abundant wild ungulates in Europe with great economic and ecological importance. It is well known that during the nineteenth and early twentieth centuries wild boars passed through the strong demographic declines and regional extinctions in Europe. Nowadays, wild boar populations have shown a remarkable increase in density. Due to the named factors, accompanied by the developments of molecular genetic tools for wildlife management and conservation, wild boar populations have become in a scope of interest in population genetic studies. In order to assess genetic diversity and population structure, sample of 73 wild boars from Czech Republic were genotyped by eleven microsatellite loci. Genetic variability parameters were calculated in Genetix and GenAlEx, while the presence of genetic structure was assessed by Bayesian clustering algorithms as implemented in STRUCTURE and Geneland. A total of 122 alleles were detected, with an average value of 11.09 alleles per locus. The observed heterozygosity ($H_0 = 0.681$) was lower than expected heterozygosity ($He = 0.743$), with an overall F_{IS} value of 0.085. Analysis of genetic structure using Bayesian methods indicated the presence of two clusters, separating the individuals from the south-western part of Czech Republic from the rest of the sample. The observed spatial pattern was further supported with significant F_{ST} value (0.034, $p<0.001$), even though the most of the variation was due to the within clusters variation (96.62%). Genetic diversity indices were lower in cluster with individuals from south-western Czech Republic in comparison to the cluster encompassing all other individuals. High genetic diversity and shallow genetic differentiation is present in wild boars from Czech Republic, indicating high genetic potential of the species.

CHALLENGES OF MEASURING BODY TEMPERATURE IN WILD BOAR

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Keywords: biologging, body temperature, behaviour, thermoregulation

Abstract: Biologging has become a major part in ecological and ecophysiological research and huge progress has been made with respect to size and accuracy of logging devices. However, when working with larger animals, things become complicated quite fast with questions arising like where to implant the logger, especially when core body temperature has to be measured. Many scientists therefore decide to implant the logger inside the abdominal cavity and sew it to the abdominal wall to facilitate explantation. Following this common practice we implanted 14 wild boar (*Sus scrofa*) with body temperature loggers and found a huge variation in 'core' body temperature with daily amplitudes of up to 9.7°C. In comparison, not sewing the logger to the abdominal wall significantly decreased the variation in 'core' body temperature. Although mean temperature was also significantly higher in free floating loggers, we still observed regular drops in body temperature of several degrees centigrade and daily amplitudes of up to 3.2°C. This indicates that core temperature of wild boars is maintained only in a small part of the body and not throughout the abdomen and therefore is very difficult to measure properly in larger species. These findings are highly relevant for the correct interpretation of 'core' body temperatures measured in large animals in general, but at the same time also allow for the identification of behavioural thermoregulation, such as wallowing, basking or huddling, especially when combined with a subcutaneous temperature logger. Despite an effect of body mass and thus differences in insulation of the wild boars, we identified general effects of ambient temperature and other environmental variables on the frequency and timing of these behaviours. Interestingly, our results indicate that wild boars show wallowing, a behaviour that decreases intra-abdominal body temperature by several degrees, already at surprisingly low ambient temperatures in winter.

WILD BOAR HUNTING STATISTICS COLLECTION FRAMEWORKS ACROSS EUROPE: NEED FOR HARMONIZATION

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Keywords: Abundance, density, distribution, data collection, hunting statistics, African Swine fever, spatial modelling, risk assessment, harmonization, wild boar

Abstract: ENETWILD (www.enetwild.com) is a consortium composed of Institutions on wildlife ecology and health, which is running a European Food Safety Authority (EFSA) project. The main objective is to collect information on the geographical distribution, abundance and structure of selected wildlife species populations relevant for livestock and human health for further risk assessment. ENETWILD currently focuses on the collection of wild boar abundance and occurrence data for the analysis of the risk factors of African Swine Fever (ASF) spread, and for the assessment of effectiveness of wild boar management measures in the affected areas. For that purpose, a normalized wild boar data model (WBDM, available at website) was released to populate a common database, which is continuously validated. The data requested refer to wild boar (i) hunting statistics, (ii) density and (iii) occurrence, including absence data. ENETWILD. As for hunting data, many European countries and organizations collect statistics, but each one has its own specific characteristics with respect to the methodology used, the type of data acquired, the repository implemented and their accessibility. In order to identifying and describing the sources of wild boar hunting data through European Countries, ENETWILD released a questionnaire in February 2018 as a basis to propose a harmonized framework for wild boar hunting data collection across European countries. Here we present an analysis of these questionnaires and subsequent proposals to harmonize wild boar hunting data collection framework across Europe. This will be essential for a future integral management strategy of this species in the international context of Europe. We thank the contribution of questionnaire respondents to this study.

SPATIAL USE OF WILD BOAR IN AN URBAN PROTECTED AREA

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Keywords: wild boar, camera traps, urban protected area, spatial use

Abstract: Wild boar is native to Belgium, but was driven to virtual extinction in the northern region (Flanders) of the country. In 2006 individual animals were observed again and the population is now increasing rapidly both in numbers and distribution area. The National Park Hoge Kempen (NPHK) was one of the regions were the recolonization process started and is still considered a core area of the current wild boar distribution in Flanders. NPHK is the only national park in Belgium and is a typical urban protected area. A global increase in urbanization leads to more frequent encounters between human and wildlife. This might enhance both the positive and negative effects of human and wildlife behaviour on each other. Possessing six tourist gates and a variety of hunting regimes but also large patches of protected forest or heathland, NPHK harbours many different forms of land use on a small area. This results in high numbers of human-wild boar interactions. Missing knowledge on several ecological parameters – including its spatial use – hamper the development of a sound management strategy to minimize the human-wildlife conflict.

The spatial use of any animal is influenced by the concepts of fear and energy, and it is shown that humans can impose a significant amount of fear on animals. Therefore, we use occupancy models to study wild boar to determine whether its spatial use is influenced more by habitat or by the strong human presence in NPHK (or both). For this, forty camera traps are rotated monthly to a unique random location within a predetermined grid. The presentation will present some of the preliminary results of this ongoing PhD research.

ASSESSMENTS OF HOGGONE® MESN FERAL PIG BAIT FOR CONTROL OF FERAL PIGS IN AUSTRALIA

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Keywords: Feral pig, toxicant, baiting, management, damage, sodium nitrite

Abstract: Feral pigs cause significant damage to agriculture and biodiversity in many parts of the world and they are potential vectors of exotic diseases that can threaten human, wildlife and livestock health, which have the potential to devastate the rural industry. Feral pigs are especially problematic in Australia and the United States where some of their largest populations occur outside their native range. These populations continue to grow today, while traditional techniques like aerial shooting and trapping are important to help curb this population growth, new tools are needed to enhance control program effectiveness. One such tool is HOGGONE® meSN. HOGGONE® meSN is a manufactured feral pig bait that contains sodium nitrite as the active ingredient. Sodium nitrite is a powerful methaemoglobin inducer, capable of causing death in feral pigs within 1 – 3 hours after ingestion. Feral pigs are particularly susceptible to this mode of action as they possess uniquely low levels of methaemoglobin reductase, an enzyme needed to keep methaemoglobin concentrations low. International research organisations in Australia, New Zealand and United States have collaborated to optimise the final HOGGONE® meSN product, which has taken considerable effort due to the highly reactive nature of the active ingredient. The optimised and patented final product is a peanut flavoured semi-solid paste that contains microencapsulated sodium nitrite. It has been extensively tested in Australia and in the United States, where it has achieved impressive results with regard to palatability and efficacy. Here we focus on the results obtained in Australia during a series of pen studies (three pens ~ 4 acres each), and a large field trial on free ranging feral pigs over 25,000 acres to replicate broad-scale use.

AFRICAN SWINE FEVER – HUNTING IN THE INFECTED AREA AND IN THE WHOLE CZECH REPUBLIC

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Keywords: wild boar, *Sus scrofa*, ASF

Abstract: In the second half of June 2017, an outbreak of the African swine fever was detected in the wild boar population of the Zlín region. In order to stop the spread of this infection and to prevent its transmission to domestic livestock, extraordinary veterinary measures were adopted. One of the main tools of the outbreak mitigation is a strong reduction of the wild boar population not only in the infected area, but in the whole Czech Republic. The hunting was strongly affected by the EC regulations and by the veterinary measures, especially in the infected area. Some of the banned hunting methods were permitted (hunting of all age categories and both sexes, shooting from cars or other ground vehicles, night hunting with artificial lighting and night vision technology, hunting during crop harvest), which significantly contributed to wild boar reduction. Feeding of game, group hunting and use of hunting dogs were banned. In the Czech Republic, a specific feature of the wild boar population reduction in the infected area was the engagement and help of the Police of the Czech Republic. Gamekeepers have been playing a significant role in the effective control of the African swine fever during the whole period of the situation development. The National Centre for Infection Mitigation that had been established immediately after the discovery of the first positively tested individuals, applied the scientific findings from biology, ecology and ethology of wild boar in the proposals of the future measures. Hunting (shooting and trapping) has been playing and important role in the effort to get the outbreak situation under control.

STUDY OF THE DYNAMICS OF WILD BOAR'S POPULATION IN ALBANIA (*SUS SCROFA*)

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Keywords: wild boar, population, Albania, *Sus scrofa*, dynamic

Abstract: Our study includes the study of wild boars (*Sus Scrofa*) population dynamics in Albania during these last 25 years. The study consists of information gathered by the Ministry of Agriculture, Albania in addition to all the methods applied in the monitoring process of this dynamic of the population. There are also several described factors related to the reduction and the increase of the density. Except this, there is a description of the variation of the dynamic as well, by applying comparative statistics methods. Our study reaches some conclusions which are considered extremely valuable for the Ministry of Environment. It helps in applying new methods regarding the estimation of wild boar`s population (Sus Scrofa). The methods are applied in European Union places and are confidential for next studies that will have to do with monitoring of different diseases/ population estimation. This is the first study ever made in Albania for this species and it ensures a very important piece of information for both study institutes and disease monitoring ones.

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