LITHUANIAN RESEARCH CENTRE FOR AGRICULTURE AND FORESTRY

WILD BOAR ECOLOGY, BEHAVOUR AND POPULATION MANAGEMENT PREVENTING CONTAGIOUS DISEASES IN LITHUANIA

Photo: Romas Barauskas, Lithuania Naturephoto

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According to the **7.1 item** of the
National Forestry Sector Development Programme for 2012-2020,
it is necessary to protect and increase forests and their resources.

To implement this aim, we need to know not only **the number of species** we have but also their **abundance** for sustainable management of forest resources including game species

The control of the renewable resources as **WILD BOAR** promotes restoration of ecosystem balance

Wild boar (*Sus scrofa* L.) is the most popular game species in Lithuania.

Their high **sociality, reproductive potential**, **adaptability**, **sinantrophy, omnivory**

and other species specific features allow wild boar to adapt in the changeable environment.

However, it causes a set of problems due continuous increase in number and damage to agriculture and forest.

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FEW HISTORICAL FACTS

Lithuanian wild boar belongs to the Central European *subspecies* ***Sus scrofa scrofa*.**

In the territory of Lithuania, the wild boar spread approx. at the end of the Early Holocene (i.e. 8-6 millennium B.C.), most in 3rd – 2nd millennium B.C.

In the period after World War 2, the number of wild boar decreased because of formerly abundant population of

predator (wolf *Canis lupus* L.),

poaching and disturbance.

Simultaneously, past **severe winters** negatively affected survival of the annual increment of wild boar population;

additionally, almost a quarter of adults were usually lost.

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Nevertheless,

- abundant supplementary feeding in winter
  (*notice*: *it was a strong tradition until 2015*),
- poaching prevention,
- reduction of predator number and further maintenance of their low-density population

= were **good measures recovering wild boar.**

Today,

overabundance exceed permissible levels

that has contributed to the emergency of contagious diseases in the absence of natural predators (as sparse large carnivores) and suitable climate changes.

Unfortunately,

quantitative management of population, as rule, is referred in danger of diseases; integrated management and monitoring is performed locally

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The analysis of the **long-term data of hunting bag** on the total area and above mentioned points under spotlight shows

= that humans **themselves**

support the sufficient and available of wild boar foraging
(*supplemental feeding*, *suitable landscape transformation)*

If population is overstocked,

= habitat will be impoverished,

= the population increment will decrease,

= the animals will be more infected by diseases and the mortality will increase;

= the damage on the habitats becomes significant.

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We aimed not only to show some facts of wild boar ecology, behaviour but also
to determine the long-term changes in population number and harvesting for contagious disease prevention.

However,

WHO IS TO BLAME?

Wild boar?

Is that so???

WHAT TO DO?

Study area location

WHAT WE HAVE DONE?

- **Census** (*FPG, tracks in snow; signs of living activities; direct observation in the points of winter supplementary feeding*)
- **Assessment *of damage*** *caused to forest and agricultural crops*
- **Monitoring** *on the model areas in the different natural regions*
- **Analysis *of the harvest data*** *in the model territories and entire country*

For the ascertaining of the age-sex structure of local populations such animal categories should be determined:

a) **males** more than 2 year of age (adults);
b) f**emales** more than 2 year of age (adults)
c) "**youngsters**" (second-year males)
d) **piglets** up to 1 year of age.

The indices of actual winter density should be taken as a basis because they are more reliable than these in summer.

The **quantitative** management of wild boar population is based on the losses of agricultural crops, population size and its annual increment.

The ratio of the population use is calculated by the formula :

N = I + (RN - PN)/y, where **N** = refers to the ratio of use, **I** = is wild boar annual increment, individuals; **RN =** is the actual number of animals on the certain territory, **PN** = is the economically permissible number of animals on the certain territory, **y** is the number of years required to recover the balance between animal number and carrying capacity of a certain territory.

SHORTLY – Fact sheet

Typical body temperature: **39.0ºC**

Female puberty -- **334 days** (~ 11 months)
Male puberty --- **768 days**

*(**in the northern regions**,*
*females become sexually mature earlier, **in 5-8 months**;*
*puberty advances due to **abundant supplemental feeding**)*

Mating period: **November – December**

(older females mate earlier and they are higher reproductive then younger ones)

Mating System: **polygynous**

Gestation -- **115 days** (~ 4 months)

Weaning -- **56 days**

Litter size 7 (viviparous)

*(**in Baltic region, 4.3-6.9, and in Southern Europe , 3.6-5)***

Litters per year **- 1.5** (*av. 1*)

Inter-litter interval **-- 230 days**

Weight at birth: -- **960 g** (*0.6 – 1 kg*)

The **most sensitive are piglets until 1-year-old, notably males**.
In the first two years, their mortality could reach even **84%.**

The critical period of survival is:

***first three months** and **autumn** (October-November)*

Thermoregulation in piglets is insufficient,
and spring frosts have fatal consequences

There is a **feedback** between **birth rate,** the **sexual structure** of local populations and **insemination quality**

(*vitality of sex cells, mating success and embryo implantation)*

The **insufficient feeding** interrupts female oestrum.

Males loss their weight even of **25% during mating period** and can be without food almost six weeks

(how it could affect their immunity – no data yet)

The **mother remains with her piglets** solidly for the first couple of weeks to protect them from enemies and other danger.

Piglets are incredibly distinctive creatures as they have light brown fur, with cream and brown stripes that run the length of their backs. These stripes begin to disappear, when the piglets are between 3 and 4 months old
(they prove to camouflage piglets into the debris on the forest floor, very effectively).

Once they **are two months old**, the piglets begin to venture out of the nest on short foraging trips,

before they become independent at **around 7- month-**old

and are almost red in colour.

The fur of the Wild Boar does not reach adult colouration until the wild boar is **about a year old.**

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For wild boar, **basic drivers of life are**

- **FOOD**,
- **SAFETY** (shelter) and
- **SUITABLE CONDITION FOR REPRODUCTION**

– if these needs are dissatisfied, animal adaptation to environmental changes will break.

Wild boar distribution, movement, grouping and abundance in the certain territory depend firstly on the
food supply,
shelter conditions and
warranty of reproduction

FEEDING

Despite wild boar **are omnivores**,

they primarily feeds **on plants.**

Plant matter comprises around **90% of the diet** as they feed on young leaves, berries, grasses and fruits, and unearth roots and bulbs from the ground with their hard snouts.

However,

previous abundant supplemental feeding caused **physiological adaptation** and **rapid increase in abundance**.

The supplemental fodders were found in the stomachs of even 70% animals and comprised up to 40% of stomach content.

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Supplemental feeding is popular in many countries and was used to help animals during the severe winter and sidetrack their attention from agricultural crops.

HOWEVER, animals adapt to supplemental feeding rapidly and do not avoid agricultural crops

– therefore: damage is still obvious

- Very flexible behaviour

Thus, supplemental feeding is not protective measure

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Baiting

promotes to make conditional reflex faster helping to WB selection and sustainable use and diminish damage caused to agriculture

(***arranging baiting*** *at a distance from landowner holdings*)

FEEDING

Wild boars (WB) visit agricultural lands surrounded by forests depending on the crop rotation and animal density.

Generally,

one individual **grub 1 ha** in forests and also ravaged **0.3-0.4 ha** of cereals from milky ripeness up to harvest and damages other crops yearly.

The damage cause by wild boar to agriculture amounts to **70-75%** of total damage to agriculture (*meanwhile, damage by deer amounts to 25-30%*).

Wild boars trample, root and eat winter and summer cereals, root crops, potatoes, caraway etc.

The **agricultural crops** are used mostly
= in summer (about **90%**)
= in autumn (**83%**) .

In the diet,
agricultural plants prevail in winter (near **79%**) *and*
*winter-spring (near **66%**)*

= one of reasons:
traditional supplemental feeding and
residues of crops in the fields.

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The total annual (*excepting autumn only*) area of **the forest litter grubbing** by wild boars is

= 0.4 % at an average in the pine forests,
= 9.0 % in the pine with spruce forests,
= 0.9 % in the mixed spruce-deciduous forests *and*
= 2.4 % in the deciduous with spruce forests.

Here, the **damage caused by wild boars** is strongly and positively related to animal density

$r = 0.97$, $y = -0.140 + 0.120x$

including the stronger damage in winter
$r = 0.88$

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Food	Share in the diet, %
Cereal	47
Potatoes	53
Beets	12
Green plants	6
Roots and bulbs	5
Berries and fruits	1.5-2.0
Tree/shrub roots & mushrooms	0.4-0.7
Food of animal origin	3.5
Needles, leaves and moss	0.2-0.4
Acorns	15

In the wild boar diet

1) beets are rare in autumn an importance increases **in winter** (*as supplemental fodder*);

2) acorns comprise **10-40%** *depending on the acorn production year*;

3) needles, leaves and moss could **comprise 2.5% in winter**

FOOD OF ANIMAL ORIGIN

comprises **3-4%** of the annual diet

- slightly more --- **5%** (*small rodents, different carrion predominate*) in winter**;**

- **3%** in spring-summer**;**

- near **2%** in spring and autumn

Examples of forest litter damage caused by wild boar

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HABITAT

The most preferred habitats are the territories of **deciduous with spruce** forests and **mixed spruce-deciduous** forests in the central part of Lithuania

Correspondingly,
the local populations of wild boar are most numerous here.

However, it should be considered that the **animal number depends not only on natural conditions but most on human factor**

(*previous abundant supplemental feeding, extensive hunting, attractive mosaic of forest edges and agricultural crops, suitable shelter conditions etc*.)

These conditions allowed wild boar spread over the country

Case 1: if wild boar density is **more than 100 animals** per 1,000 hectares (*or up to 115 /1,000 ha),* wild boars visit 23-52% of the agricultural crops within the radius of 1 km.

Case 2: If the density reaches 12 animals per 1,000 ha (12/1,000 ha), wild boars visit 6% of the agricultural crops,

Case 3: **if the density is only 6/1,000** ha, they visit 3% of the agricultural crops

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Wild Boar are **nocturnal animals and prefer dark**

- They only come out in the dark to forage for food.
- They spend around **12 hours sleeping** in a dense nest of leaves during the day
- They are **highly social animals**

In Lithuania:
the **spring herds** are most numerous
(*av. **6 individuals** and animals at the maximum*) .

In summer and in the **beginning of autumn,** the herds decrease
(*the average size is **5 individuals***).

After the **weather became colder**, animals form more numerous herds, up to 35 individuals
(*av. size **5.5 individuals**).*

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The average moving is

0.3 -10.5 km

depending on season, animal age and sex.

The average herd moves

near **1-2 km** in winter

up to **10-12** km in summer.

Under disturbance:

movement reaches near **10-20 km** per day.

Longer moving is specific to males.

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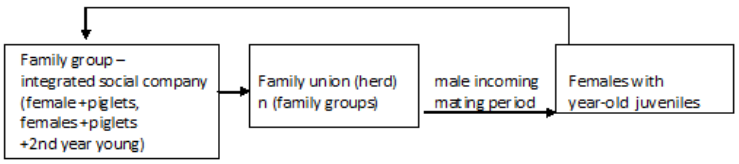
Wild boar herd changes and specific features



piglets ignore herd hierarchy, states display in 10 month of age	herd increases in number; males of 18 months of age are expelled from the herd; females, piglets & two year old females remain	gestation (4 months);females sidestep to the remote sites 1 day until bearing; juveniles lead her but do not come closer than 30 steps; bearing: 1-10 piglets av. 5
1) leadership: dominant-leader	1) twice leadership: dominant and leader	1) leadership: dominant-leader
2) territoriality	2) territoriality	2 territoriality tenuous
3) intensive food consumption	3) intensive food consumption	3) uneven food consumption
4) roles have been indentified	4) roles have been indentified	4) roles have not been indentified
5) all-round defence of piglets	5) active all-round defence of piglets	5) weak defence of juveniles (all-round defence is absent)

Wild boar herd changes and specific features

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In Lithuania, foresters and game managers have dealt with a problem of the restraining and reduction of the damage by wild boars.

The effective protection and decrease in losses are possible if we perfectly **recognize reasons of wild boar damage and factors necessary to improve methods of damage prediction and assessment.**

The wild boar population is managed **territorially, quantitatively and qualitatively**

The **local population** of the wild boar is the **object of management**.

This approach provides scientific evidence of population use considering the carrying capacity of the certain territory and maintaining the optimal population density

The territorial management should be performed in the forest complex of **5--10 thousand** hectares considering

a) **the size of the home range,**
b) **seasonal migration /moving of wild boars.**

The annual biological increment of wild boar local population **is 50-60 %**

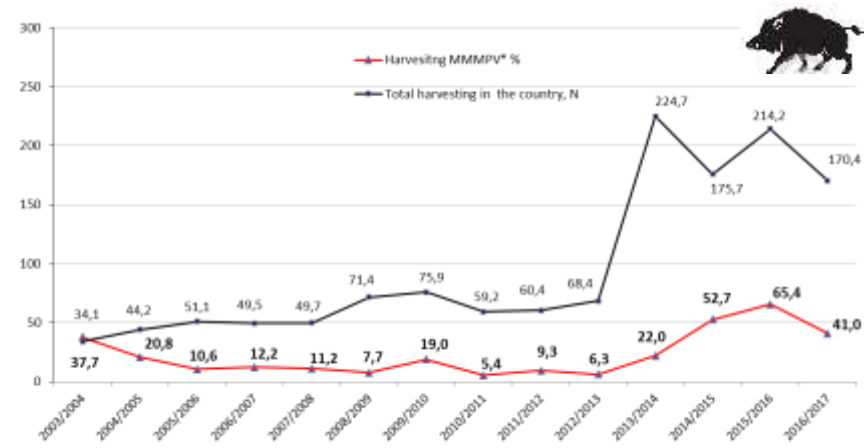
the annual increment coefficient is 1.0-1.5, and sex ratio is 1:1.5.

The harvesting volume should be changed considering winter severity.

Following severe winters, and then the annual increment is only **0.6-0.7** harvesting volume is reduced up **to 60-70 %.**

If foraging in winter is sufficient, **80-100 % harvesting is allowed**.

**MMMPV – model area, hunting ground unit for science and education of Institute of Forestry LAMMC*



Hunting seasons, years

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Avoiding the sudden changes in animal number and outbreaks of possible contagious diseases

= **the sex ratio of the male to female should be 1.0 : 1.5**

= **the share of juveniles younger than 1 year 70 -- 80 %**

= **older juveniles 15 -- 20%**

= **adult animals 5 --10 % in the hunting bag**.

The complete extermination of the population is IMPOSSIBLE
(*territory – free, and is not defended; most attractive for intruders)*

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On the total area, the long-term average harvesting was only

H_{tot}= **47%** in 1939-2014, and

56.4% during the last decade (*here H –hunting bag)*

On the **model territory** of the extensive harvesting

H_m= **17.9%**

instead recommended 100%.

Quantitative population management, unfortunately, is referred only in danger of the contagious diseases as recently

H_{tot}= **224.7%** and

52.7%, respectively.

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Wild boar density is unrelated to their annual increment.

Despite the largest increment was revealed in the **mixed spruce-deciduous** forests and the lest one – in the **pure pine forests**,

= **these differences are insignificant** and similar to other regions.

It shows that **long-term inappropriate management the natural adaptation was disturbed.**

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The wild boar density norms depending on the forest categories were approved even in 1983.

This fact shows that **it is necessary to consider wild boar density** in the certain territory and their

mobility,

changes in the mother group structure and

female philopatry (*female affection to native territory*)

Maintaining the maximum permissible density and harvesting 100 % of the annual increment of population,

= the total output of the boar meat is about 47 % of the total game output

Maintaining the maximum permissible density (4 and more) the category of the forests should be considered, e.g.

= pure pine,
= pine with spruce,
= mixed spruce-deciduous
= deciduous with spruce forests and their functional purpose.

Maintaining of the optimal permissible density in the forests and if the total hunting bag **is 100 % of the annual population increment** ,

= is an important measure **to decrease the danger of contagious diseases**

= allows to prepare near 300 tons of the boar meat annually that comprises 55 % of the total output of game.

TODAY:

Initial argument: Wild boar census is still imprecise, and the integrated management and monitoring missing:
= but - implemented in the model territory;

Initial argument: the population has not been assessed qualitatively

= the role of the wild boar sex/age in the disease transmission depending on season and its unusuality, and landscape elements, whose could be helpful preventing diseases,

= have to be determined in the model territory;

Initial argument = the effect of herd composition in disease transmission and survival are not studied yet; data on the effect of distribution, survival, supplemental feeding, and hunting methods of infected animals are not available
= partly implemented in the model territory

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Who is blamed?

Today in game management, we consider the CIC strategy of **sustainable hunting.**

Some countries (Italy, Spain, Portugal e.g.) indicated that driving hunting, namely, is the best measure to protect agricultural crops against damage caused by wild boar. The drive hunting with dogs is most popular here.

What decision of the control method should be accepted?

However,

wild boars usually retreat from such territories despite baiting; **unfortunately**, the baiting recedes into its background (also labour and time expenditures).

However,

driving hunting affect animal species differently.

Wild boar distribution differ from one of other ungulates –
= they usually retreat from the home territory as far back as before depletion of the food supply when animals are of the good condition and mortality is low.

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NOTE:

The effectiveness of preventive measures

including **limited baiting** or **target harvesting of females**
that are still used,

could **appear only after several generations**.

Drastic hunting causes the certain effect of "vacuum"
as the boundaries of animal territories are not defended,
and other animals – intruders **including infected ones**
can attend these territories

Simultaneously, such situation makes intensive reproduction
and potential infection in young animals, while these
communicate with other ones more active. Thus, the
diseases spread again.

Therefore, **the social behaviour should be considered**

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It is notorious that

Wild boars live in the comparatively large social units –
mother groups (*called sounds*)
that are composed of several females and their offspring

The changes in sounds appear
when young males move away from the sound **at the age 18 months**

These young males **become innovat**ors that spread in the new territories.

The pubescent males travel longest distances

Only around 11% of females and even 55% of males spread over 10 km.

From the sound territory, males move away on average 16-17 km and females 4-5 km.

In few cases, single males moved over 100 km (Sweden) and 250 km (Poland)

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Wild boars **travel seasonally** within their home territory
depending on the distribution of food availability
(e.*g. often in autumn due to acorn production)*

In home territory, the travelling distances **do not exceed 1 km** during foraging or reaching rest points

When are disturbed, or observe the territory, or travel from adjacent fields to the resting points

- **the distances could reach 2 km**

In the territories of less forest cover, wild boars **distribute more than animals in the forested territories**

The animal density (*number per unit area*) is not related to the distribution distance

Moreover, if wild boar is not abundant and their densities are low,

the social groups are unstable and more separate.

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It is still unclear,
why only few individuals are infected on the certain territory while other members of social group are still healthy?

We cannot maintain that they could be infection carriers as the virus acts animals as quick as through

Wild boars catch disease not only through direct contacts (*via secretions, blood, sperm*) but also indirectly (*via transport, food and bait, different raw materials etc*.) and through placenta to foetus;

Moreover, the virus can also be transmitted by wild birds, insects, and, surely by **humans themselves**.

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FINAL COMMENTS

Insufficient control causes further increase in population number until its self-regulation. Simultaneously,

- migration increases;
- animals search for new suitable habitats;
- transmission of diseases increases;
- animal immune system weakens;
- interrelations and usual feeding behaviour disrupt;
- damage to environment increases

and causes threat of sustainability of animal species environment

Therefore, the wellness of wild boar population becomes the significant challenge today