

## FOREST HABITATS USE BY WILD BOAR IN THE ZIELONKA GAME INVESTIGATION CENTRE

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**Abstract.** The research was aimed at establishing the degree to which wild boar used different parts of habitats in a large forest complex. In the Zielonka Game Investigation Centre, wild boar most actively rooted from October to March, in fresh mixed broadleaved forest and fresh broadleaved forest, in stands aged over 41 years.

**Key words:** wild boar, rooting, habitat, transect

### INTRODUCTION

Wild boar has a strong capability to adapt to various habitats. It is a eurybiotic species, i.e. it may live in extremely different environments: from fertile broadleaved forest, mixed stands, and pure coniferous monocultures to marshy grey willow scrubs. In Poland, wild boar prefers larger forest complexes with numerous forest crops and young woodlands, divided by plots of field crops, meadows and riverside reeds. In oak and beech mast years, wild boar is observed to migrate to areas with a large proportion of these tree species. The most favourable conditions for wild boar are provided by larger complexes of broadleaved forests (oak and beech), as well as mixed broadleaved or coniferous forests with young coniferous woodlands. Also, the animals often penetrate marshes, bogs, and marshy meadows. It is essential for wild boar to find enclaves of forest meadows and field crops near the forest [Fruziński 2002].

Wild boar is less numerous in Scots pine (*Pinus sylvestris* L.) monocultures, and it increases in number along with gradations of forest pests which spend some of their development stages in the soil or litter [Pielowski 1989].

Rooting, which is the way wild boar searches for food, largely changes the ecological conditions of the forest bed. During an intense and deep rooting, wild boar tears the plant cover off the soil, scarifies the mineral soil, and mixes it with litter and other parts of plants. Such activities greatly accelerate humification and facilitate the access of

oxygen to upper soil layers. A less important, but still very prominent role of wild boar consists in moving organic material between ecosystems, i.e. between forest and arable land, by feeding and excreting. By living in forests and feeding in fields, wild boar serves as a channel for conveying organic material, which is more beneficial to forest as the animals spend there more time. Apart from the forest area, wild boar also intensely roots in fields, readily feeding on potato, beet, turnip, carrot, cereals, and all leguminous plants. This species naturally prefers feeding in abundant potato or maize fields to painstakingly searching for food in litter. Despite damages caused by wild boar in crop fields, its effect on the forest biocenose is greatly beneficial [Jakubowski 1996, Łabudzki 1999].

The researchers attempted to track the varying food preferences of wild boar in various parts of a forest complex in a year cycle, with relation to the fertility of habitats (forest site types) and the age structure of forest stands. The aim was not to examine merely the reason for rooting, i.e. to determine the type of food sought after, which is a separate issue. Instead, the researchers aimed at identifying the percentage changes in the use of various areas (sites, forest stands) in a lowland forest complex.

## STUDY AREA

The research was carried out in a selected area, being a fairly contiguous, large forest complex and to a large extent representative of both Wielkopolska lowlands and other regions of Poland that are similar in terms of physiography. The biggest part of the study area was located in the Zielonka Game Investigation Centre (Zielonka GIC).

Located 15 to 35 km north-east of Poznań within the Łopuchówko Forest District and Zielonka Experimental Forest District, Zielonka GIC is ca. 13,000 ha in area with ca. 7,500 ha of forest. Its hunting management is carried out by the Department of Game Management and Forest Protection, Poznań University of Life Sciences.

According to the nature and forest regionalisation, based on ecological and physiographical data, the study area lies within Region 3 of Wielkopolska-Pomorze, in the Province of Wielkopolska-Kujawy Lowlands. The eastern border of the beech, sycamore and chequer tree natural range runs through the Province; however, the spruce and fir range is beyond the study area.

The Zielonka GIC aquatic conditions can be considered good, if one takes into account the number of lakes, rivers, ditches and other water-courses. However, given the Province's climatic conditions, the hydrologic balance of the area is largely affected by a relatively low precipitation (ca. 500 mm a year).

Site conditions mainly support the development of Scots pine and mixed coniferous forests. The degree of flora diversity under similar soil conditions usually depends on the level of underground water which affects the diversity of litter, undergrowth and stand composition. In the Zielonka GIC, one can find most lowland forest stand types. Such a structure allows many tree, bush, dwarf shrub and herbaceous species to grow and constitute a rich food base for game. According to the updated site classification, fresh mixed broadleaved forest (63%) covers the largest area, with Scots pine as the dominant species and oak (*Quercus robur* L.) as the main admixture. Oak presence is essential for many consumers, but mostly for wild boar. Many stands feature bird cherry (*Prunus padus* L.), rowan (*Sorbus aucuparia* L.), hornbeam (*Carpinus betulus* L.)

and alder buckthorn (*Frangula alnus* Mill.) in the undergrowth layer, providing game with a good shelter and a diverse food base. The most common are stands aged 21-40 (ca. 21%) and 41-60 years (ca. 20%), while the least common are stands falling into the class for regeneration (i.e. those with insufficient level of regeneration).

Forest stands of all ages are present, which makes the food base even more diverse and rich. A distinct dominant species is Scots pine (ca. 80%), followed by oak (ca. 15%).

The agro-forest boundary is 135.6 km long, accounting for ca. 75% of the total length of all boundaries. As the total forest area is ca. 7,500 ha, the distance between the forest centre and the boundary is relatively small, allowing wild boar to move quickly from the heart of the forest to the arable land.

## METHODS

The research was carried out during the following three hunting seasons: 2004/2005, 2005/2006, and 2006/2007. During the initial field works in the study area, nine research plots (transects) were selected, varying in length and 10 m in width, running the length and breadth of the forest complex. The transects were localised based on the representativeness of various sites and the age structure of the stands. The transects were from 2,400 m to 8,500 m long, and their total length was 48,300 m. However, not all the transects were used in each study season.

Transect axes were determined with a compass, and permanently marked on trees with special paint. The course of each route was measured with a tape measure and permanently marked on a tree every 100 m, beginning at a transect's starting point. This method facilitated the exact location of wild boar rooting sites, as well as checking the locations on a forest district map and collecting data from stands descriptions of the forest units where new rooting sites were found. The width of the transects (5 m to the left and right from the axis) was also marked, so the observations were made within a transect of a known surface area.

Usually two persons (employees and last-year students of the Department of Game Management and Forest Protection) checked the transects in regular monthly intervals. When a new rooting site was found, it was recorded against the following criteria:

The depth of a rooting site:

- I. Surface rooting (litter disturbed)
- II. Moderately deep rooting (up to 10 cm of the mineral soil layer)
- III. Deep rooting (more than 10 cm of the mineral soil layer).

The type of a rooting site:

- A. Continuous patch rooting site – the size of a rooting site was determined
- B. Intermittent rooting site – the size of the area disturbed was determined as a percentage of the overall rooting site
- C. Single rooting site – the size of a rooting site was determined.

All the research plots (transects) were described in detail based on stands descriptions of forest compartments, mainly with respect to:

- area
- forest site type
- age and structure of stands and the soil, cover and undergrowth layer.

## RESULTS

What follows is the synthesis of the most important results of the research, indicating the local – and, to a large extent, typical in a lowland forest complex – preferences of wild boar as to using various forest sites in a year cycle, with regard to the age of the stands.

### Hunting season 2004/05

The observations in the first season were made from July 2004 to the end of March 2005. The overall study area was four selected transects: two of them (I and II) running from east to west, and two (III and IV) from north to south. Transect I was 8,500 m in area, transect II 8,000 m, transect III 4,900 m and transect IV 5,200 m. The overall length of the route was 26,600 m. As the transects were checked at the same time, they constituted a common study area in a month and hunting season cycle.

The rooting rate in each forest site type was identified by a percentage calculated as a proportion of the surface area of all the rooting sites found to the overall surface area of a given stand type that was represented in a transect. The rooting rate was identified for fresh broadleaved forest (FBF), fresh mixed broadleaved forest (FMBF), fresh coniferous forest (FCF) and fresh mixed coniferous forest (FMCF), as these four forest site types accounted to over 96% of the study area.

- The highest rooting rate in the forest complex was recorded from November to January in FBF, FMBF, and FMCF.
- The size of the area disturbed by wild boar as the percentage of the overall study area reached 5%.
- Wild boar rooted most intensely in stands aged over 51 years.
- In years when oak and beech provided less acorns and beechmast, in autumn and winter wild boar mainly turned to larvae and *chrysalides* wintering in the soil and litter.
- Deep rooting sites (in search of rodents) were found sporadically.
- Wet sites were penetrated only in summer and in February.
- Rooting rate in forest was found to be lower in spring and late summer, as wild boar migrated to fields.
- Stands younger than 21 years, especially the coniferous ones, played an important role as a refuge, while their role as a potential rooting area was limited.

### Hunting season 2005/06

As with the previous season, observations were carried out in the same four transects with a total length of 26,600 m. The transects were checked at regular monthly intervals from October 2005 to the end of September 2006. In line with the established methodology, the observations concerned the same sites (FBF, FMBF, FCF and FMCF) and the age structure represented at each transect. It is natural that the rooting rate calculated for this season – being a proportion of the surface area of all the rooting sites to the overall surface area of a given stand type that was represented in a transect – was to a certain extent different from the rate calculated for the previous season.

- From October to April, wild boar most intensely rooted in FMBF (3.99%), FBF (3.07%), and FMCF (0.66%).

- The highest proportion of the area disturbed in a given forest site type to the overall research area was 6.07%.
- Wild boar rooted more intensely in stands aged over 51 years.
- The deep rooting sites that were occasionally encountered were left by wild boar searching mainly for rodents.
- In summer, wild boar significantly reduced rooting in forest areas as the animals migrated to the nearby field crops.
- Wild boar often rooted in stands younger than 21 years, treating them as a refuge rather than a source of food. Exceptions were forest crops and young woodlands on a former farmland, where wild boar intensely searched for grubs.
- Wild boar rooted in the wettest sites in winter, when it was impossible to root in other sites which were then frozen, and in summer, with sanitary and refreshment purposes.

### Hunting season 2006/07

In the last phase of the research, all the nine transects established for observation purposes were used. As their total length was 48 km, the observations required considerable efforts of technicians and students of hunting. According to the location of the transects in the Zielonka GIC forest complex, they were all combined into three large research plots which were analysed separately against the criteria established earlier:

**Research plot 1** (four transects of 26,600 m in total length). Observations from April 2006 to March 2007

- Wild boar rooted most intensely from November to February in FBF, FMBF and FMCF.
- The size of the area disturbed as a percentage of the overall research area was 4.6%.
- Wild boar rooted most intensely in stands aged over 51 years.

**Research plot 2** (two transects of 13,200 m in total length). Observations from June 2006 to May 2007

- Wild boar rooted most intensely in forest areas in autumn and winter (from October to March) in FMBF (1.76% in December), FBF (4.55% in June and 3.45% in December) and FMCF (0.82% in November).
- The largest proportion of the area disturbed in a given forest site type to the overall research area was 4.55%.
- Wild boar rooted most intensely in stands aged over 51 years from October to March.

**Research plot 3** (three transects of 8,500 m in total length). Observations from April 2006 to May 2007 were carried out in the Łopuchówko Forest District (Zielonka GIC). Three forest site types were represented: FMBF (72%), FMCF (17%), and FBF (11%).

- Wild boar rooted most intensely from October to March; the rooting rate was the highest in February and much lower from May to July.
- Wild boar most often occurred in FMBF and FBF.
- Wild boar most often rooted in stands older than 41 years.

The wild boars definitely avoided stands younger than 21 years as the animals found no attractive food in forest crops and young woodlands, treating them only as a shelter during daytime rest. During the research, lairs were often encountered in these sites.

Most rooting sites found were the intermittent rooting (64%) and surface rooting ones (65%), which stems from a fairly intense acorn production in the previous autumn. The size of each rooting site and the total rooting area most likely depended on the type of food eaten by wild boar. The largest rooting sites were those where wild boar searched for acorns; the animals ploughed shallow only through the litter layer, usually without disturbing the mineral soil layer. On the other hand, the narrow, fairly short and deep rooting sites were found in areas abundant in grubs.

## SUMMARY

To sum up the three-year observations on the use by wild boar of various parts of sites in the study forest complex, one can notice that in spring and summer (from April to September) wild boar feeds mainly on agricultural produce. The game is attracted by the abundance and vicinity of easily accessible food. In September, wild boar feeds on potato and maize crops, and in late summer the maturing wheat, cereal mix and maize crops provide wild boar not only with excellent food but also with a day and night shelter. As lots of mushroom pickers penetrate forest stands at the end of summer, the animals are disturbed and find peace and quiet in fields; hence, the rooting rate in forest is lowest from April to September.

One can expect that the rooting sites that were sporadically recorded in this period in forest areas were made by wild boars older than three years of age. These animals persistently search for food in forest, and feed very shortly and usually at night time in field crops; 35% of their diet comprise the leftovers of acorns, rhizomes and roots of forest plants.

In autumn and winter (from October to March), wild boar prefers forest areas, especially the fresh mixed broadleaved forest. In this period, the animals have very little chance to easily feed on agricultural produce in field crops, so they feed on mature acorns and beechmast in oak and beech mast years [Wlazelko and Łabudzki 1992], as well as on chrysalides of primary pests wintering in litter in Scots pine stands. Hence, the rate of wild boar rooting distinctly increased in autumn and winter. For example, wild boar found it a lot easier to root in season 2006/07 which was characterised by an almost snowless winter and a high rate of temperatures above zero. In comparison to observations made in similar transects during other seasons, one can see a distinct decrease in the size of the area disturbed by wild boar. The largest area disturbed accounted to 9% of the total area in season 2005/06, while the area disturbed in 2006/07 was three times smaller, i.e. 2.47%.

The rate of wild boar rooting also depends on weather conditions. A thick snow cover makes it difficult for the animals to find food, which raises the rooting rate.

The degree to which wild boar roots in the upper soil layer also depends on the age of a stand. The research revealed that wild boar mostly penetrated older stands with a significant proportion of oak in their species composition. By and large, the animals avoided stands younger than 21 years, and only few rooting sites in stands aged 21-40 years were found, in a fresh mixed coniferous forest site. The lairs found in forest crops and young woodlands prove that such areas serve wild boar only as a shelter during daytime rest.

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## WYKORZYSTANIE RÓŻNYCH BIOTOPÓW LEŚNYCH PRZEZ DZIKA NA TERENIE OŚRODKA HODOWLI ZWIERZYNY „ZIELONKA”

**Streszczenie.** Badania dotyczyły wykorzystywania w różnym stopniu odmiennych fragmentów biotopów w dużym kompleksie leśnym. Największa intensywność buchtowania na terenie Ośrodka Hodowli Zwierzyny „Zielonka” następowała w okresie od października do marca. Najczęściej odwiedzanymi siedliskami przez dziki były LMśw i Lśw. Dziki zazwyczaj buchtowały w drzewostanach III klasy wieku i starszych.

**Słowa kluczowe:** dziki, buchtowanie, siedlisko, transekt

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