

Regina MACKIN

**Dynamics of Damage Caused by Wild Boar
to Different Agricultural Crops**

[With 5 Tables & 5 Figs.]

Analysis was made of the distribution of damage done by wild boar (*Sus scrofa* Linnaeus, 1758) throughout the year in three typical regions of Poland: north-east, central and south-west. The amount of damage done to different crops was examined and calculation of the distribution in percentages of damage to different crops over the whole Poland was made. Oats and potatoes are especially preferred. The period of maximum intensification of damage is shortest in the north-east, and lasts for the three summer months (July—September), but is longest in the south-west, where it lasts 5 months (May—September). Amount of damage was shown to depend not strictly on the density of wild boar in the study regions, but rather on the inavailability of beech and acorn mast. When these wild foods are consumed, boar then invade cultivated crops.

1. INTRODUCTION

Damage done by game animals to agricultural crops causes continually increasing losses to the national economy. The great majority (about 70%) of crop damage is due to wild boar (*Sus scrofa* Linnaeus, 1758).

The purpose of the present study was to trace certain regularities in the dynamics of occurrence of damage done by wild boar over the yearly development cycle of field crops and to compare the extent of such damage and periods of its intensification in different crops in three regions of Poland.

It is essential to ascertain the period in which damage is greatest, and to determine the food preference for cultivated plants by wild boar to ensure management of these animals and to reduce crop damage by biological counteraction, using the method of Andrzejewski & Jezieriski (1969).

2. MATERIAL AND METHODS

Studies were made in 19 state forest administration districts (FAD) in three regions in Poland (Fig. 1). In region I, in the north-east (Białystok and Olsztyn voivodships) data were collected from 6 FAD; in region II, the Poznań voivodship,

from 7 districts; and in region III, in the south-west (Wrocław and Opole voivodships), from 6 districts. In regions I and III, each of which included two voivodships, an attempt was made to collect data from districts near the boundary of the two voivodships, so as to treat them as one region. Districts were also chosen in each region on the basis of data from the District State Forests Boards according to the amount of compensation previously paid for damages and where wild boars were numerous. Preference was also given districts near each other or contiguous.

The following data were collected from forest district: 1) extent of damage done to each crop by game animals during 1965—1967 on land adjoining the forests in the forest district; 2) the number of game animals in the district concerned; 3) species and age composition of the three stands and 4) amount of acorn and beech mast.



Fig. 1. Study regions in Poland. Explanations in the text.

When estimating each particular instance of damage, measurement was made of the area of damaged crop and percentage of destruction. The product of damaged area multiplied by percentage of destruction gives the reduced area. The reduced area multiplied by productivity/ha gives the extent of damage in quintals (100 kg). After taking into consideration the prices which the farmer receives for each product it is possible to calculate the amount of compensation.

The amounts of damage expressed in hectares of reduced area are taken from the final reports estimating damage caused by wild boar and deer. When collecting data use was also made of reports of estimated damages caused by wild boar and deer. In these cases it was assumed that 50% of the damage was caused by wild boar since no evidence to the contrary was available.

Data on the number of wild boar from 1965—1967 were obtained from the game stock lists drawn up in each FAD.

The percentage of different species of trees and classes of their age in the forest areas, describing the age and species structure of the treestands for each FAD were obtained from the Forestry Management Plans. Information on acorn and mast fall in the study years was obtained from forest district employees (verbal communications). The above data were used to draw up descriptions of wild boar density and their habitat in each FAD.

Also used were data in the Statistical Year Book of the Central Statistics Office on: 1) area sown in each crop on individual farms in the regions examined to describe their agricultural structure; 2) productivity in quintals/ha of crop in which damage was done to convert damage to quintals.

The prices paid for compulsory supplies of different agricultural products were used as a basis for calculating the extent of damage in Polish currency — according to Order of the Council of Ministers no. 202 dated 30th July 1965.

Table 1.

Numbers of wild boar in different study regions for period 1965—1967.

Regions	1965	1966	1967	Avg. density/1000 ha
Region I	505	535	604	15.6
Region II	909	999	1 036	17.9
Region III	444	451	471	11.8

An attempt was made to estimate the amount of damage done by wild boar in the more important agricultural crops throughout Poland. To do this amounts of compensation paid for damage throughout Poland during the period of our studies was taken as the initial value in the whole calculation. As compensation is paid for damage caused by wild boar and deer jointly, it was assumed that 70% of the sums paid constituted compensation for damage caused by wild boar. This assumption was made on the basis of data given by Haber (1969) and of the ratio of number of reports on estimated damages caused by wild boar to the number of such reports on damage caused by deer. On the basis of the amount of damage in percentages for each crop (relative to the entire value of damages in Polish currency) in the three study regions, calculation was made of the extent of damages to different crops (in quintals and hectares) for the whole country.

At the same time comparison was made of the structure of crops in the three study regions and in whole of Poland. It was found that the structure of crops in the study areas is similar to the structure of crops for all Poland (Statistical Year Book, Central Statistics Office, 1968).

3. DESCRIPTION OF THE STUDY AREAS

The numbers of wild boar and their density in the three regions examined are given in Table 1. When the wild boar population was compared for the year 1965—1967 numbers are observed to have increased in all areas, this increase being greatest in the Poznań voivodship.

The natural food supply in the forest is indicated by the percentage of heavy-seeded species, mainly oak and beech (Boback, 1957). This percentage varies

within limits of 6—7% in the study regions and is generally greater than the percentages of birch, alder and poplar (except for region I). The percentage of such species as birch, alder and poplar is relatively small (region III — 2.6%, region II — 5.5%, region I — 14.4%). The importance of these species, particularly alder, as components of forests in which wild boar live, is greater a poor acorn crop years when considerable numbers of wild boar remain in these wet areas, finding large amounts of plant food, chiefly mud and water plants (Haber, 1969).

Table 2.

Species and age structure of tree stands in the FAD of the regions examined.

Region	Pine, spruce, larch, (%)	Oak, beech, hornbeam (%)	Birch, alder, poplar (%)	Trees tands (%)	
				1—20 yrs old	Older
I	72.6	6.6	14.4	20.5	76.7
II	86.3	7.3	5.5	29.0	64.5
III	89.8	6.1	2.6	20.4	77.1

Table 3.

Damage caused by wild boar to agricultural crops (expressed in ha of reduced area) for 3 regions of Poland for period 1965—1967.

Region	Total, ha	Hectares/1000 ha	Hectares/1 wild boar
I	177.42	5.0	0.32
II	662.70	12.1	0.67
III	527.53	13.7	1.15

The 1966—1967 season was an oak-seeding year in almost all the forest districts examined. No beech-seeding year occurred in any of these districts.

Wild boar find the best conditions to make their lairs (defined by the extent of young tree stands in the area) in the forests of region II (Table 2).

4. ANALYSIS OF RESULTS

4.1. Relationship between Damage in the FAD and Numbers of Game Animals

No direct relation ($r = 0.24$) was found between the extent of damage and the numbers of wild boar.

4.2. Extent of Damages Expressed in Hectares of Reduced Area/1000 ha of Forest and Reduced Area/Wild Boar

Due to the variability in number and size of forest districts, calculation of extent of damage to reduced areas per 1000 ha of forest indicated greatest loss in the south-west region III, slightly less in region II and

least in region I (Table 3). The unequal number of game animals in the districts also made it necessary to convert loss to reduced total area/wild boar. This was greatest for the south-west region and smallest for the north-east region (Table 3). In region II 1 wild boar destroyed 0.67 ha of fields. Greatest damage/1000 ha of forest and greatest damage/wild boar was therefore in region II.

4.3. Damage Intensity and Distribution in Time

Analysis of the extent of damage in each of the study years showed that this was greatest in 1967 (527.55 ha) and slightly less in 1965 (445.98 ha). The least damage was done in 1966 (393.12 ha). When these data were compared for the different regions it was found that 1966 was the

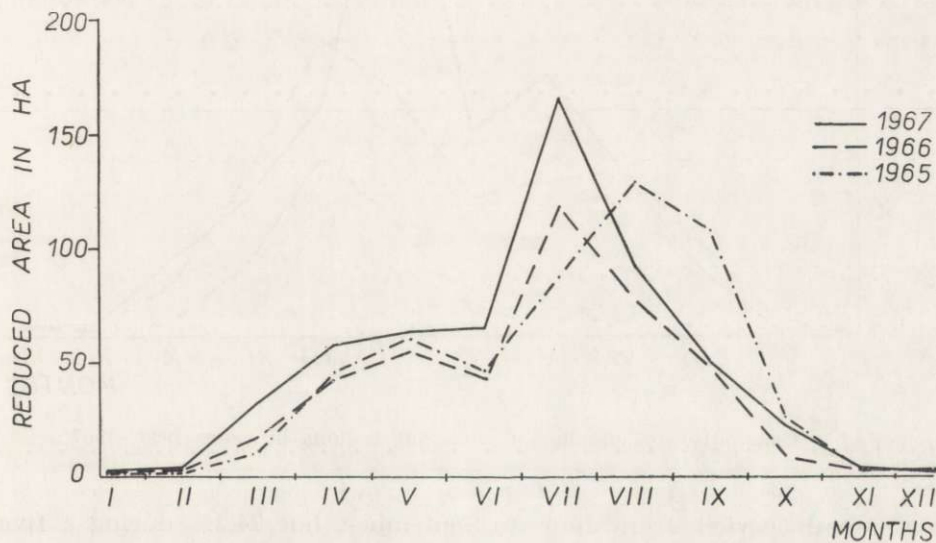


Fig. 2. Damage by wild boar to agricultural crops in different months and in successive years.

year of lowest damages in all voivodships examined. The amount of damage done in different months is similar in successive years. Damages increase from March until July—August, then decrease (Fig. 2).

As no great differences were found in the distribution of damage in different years, their distribution has been presented jointly for the whole of the study period (1965—1967). The duration of the period in which damage is particularly intensive is not the same in the regions examined (Fig. 3). In the north-east area this period is shortest (July to September). During this time 80.8% of the total damage occurs in this region. The period of intensive damage in the two other regions is more extended in

time. In the Poznań voivodship it lasts from May to August (74.3% of total damage), although damage in April and September is also high (17.9%). The period of intensive damage in cultivated fields is longest in the third, south-west region: only 62.7% of damage is done during the

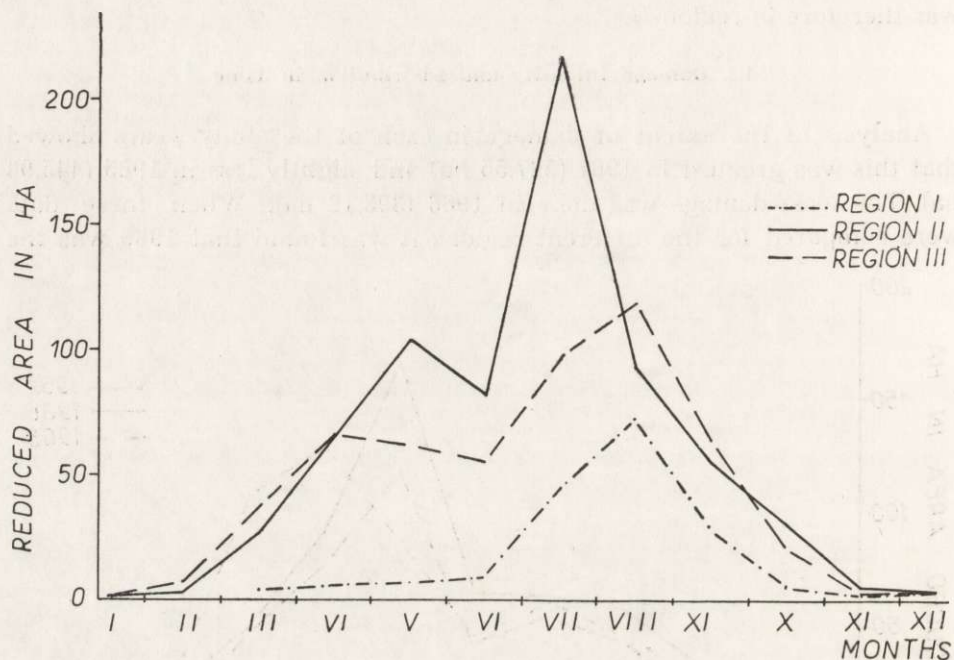


Fig. 3. Distribution of damage in different regions in years 1965-1967.

four month period from June to September, but 74.2% during a five month period (May-September), that is, as much as in region II during a four month period.

4.4. Damage Done by Wild Boar to Different Crops

The intensity of damage done to the more important field crops varies according to region (Table 4). In the Białystok and Olsztyn voivodships the greatest damage is to potatoes (27.3%), and the remainder to oats (25.8%), mixed corn, rye, wheat, meadows, barley. In region II rye is most heavily damaged (37.5%), then potatoes (22.0%), oats, mixed corn, barley, meadows and wheat accounting for the rest. In the south-west region the highest percentage of damage was in oats (26.0%), then wheat (22.4%), potatoes, rye, meadows, mixed corn, barley suffering less damage.

The differences between the percentage formed by these crops in the damages done in different regions and in the structure of crops sown in the three regions indicate the wild boar's food preferences (Table 4). At the same time the amount of the given crop in the sown crop structure to a certain extent affects the damage done to it. Of the crops investigated, wild boar specially prefer oats and potatoes in all regions (*e.g.* in the Poznań region oats from 18% of the damaged crops, whereas they form only 5.8% in the whole area of crops sown in this region).

When the extent of damage to different crops expressed in hectares (Table 4) and in quintals (Fig. 4) is compared, differences in percent damage are found in the order of damage done to crops. These are due to the unequal productivity of crops per 1 ha, particularly when potatoes and cereal plants are taken into consideration. In the north-east region

Table 4.

Percentage of more important crops in reduced area (expressed in ha) and in the sowing structure *).

A — in damages, B — in sowing structure

Crop	Region I		Region II		Region III		All regions jointly	
	A	B	A	B	A	B	A	B
Potatoes	27.3	17.9	22.0	20.2	21.9	18.3	22.9	19.1
Oats	25.8	13.4	18.0	5.8	26.0	11.8	22.0	10.7
Mixed grain	17.0	—	8.0	—	2.5	—	7.1	—
Rye	13.0	29.2	37.5	37.2	19.5	12.6	24.0	27.9
Wheat	5.6	5.7	2.2	6.1	22.4	24.6	10.0	10.8
Meadows	4.1	—	2.4	—	8.5	—	5.6	—
Barley	1.5	3.5	2.9	4.8	1.1	2.0	3.6	3.7

*) Data on sowing structure from Statistical Year Book, Central Statistics Office 1968. No data available for meadows and mixed grain.

of Poland the harvest of potatoes varied from 177 quintals in the north-east through 182 quintals in the Poznań region to 196 quintals in the south-west region. Productivity of cereal crops, on the other hand, fluctuates around 20 q, hence there is a certain shift in order of crops according to the percentage of damage they form. Only in north-east Poland is this order almost the same. The differences being due to the fact that hay productivity is twice (in quintals per ha of meadow) that of wheat in quintals per 1 ha.

The relative amount of damage to different crops is shown in Fig. 5 after converting it from quintals to Polish currency. The few slight changes in order of crops which can be seen there are due to differences in prices of different agricultural products, chiefly wheat, the price of which is very high.

4.5. Amount of Damage Done by Wild Boar to the More Important Field Crops Throughout Poland

On the basis of the amount of damages to different crops in the three study regions, an attempt was made to approximate the damage done to these crops by wild boar throughout Poland.

Knowing the percentage of damage to crops examined in relation to the total value of damage in Polish currency in the study region, the total

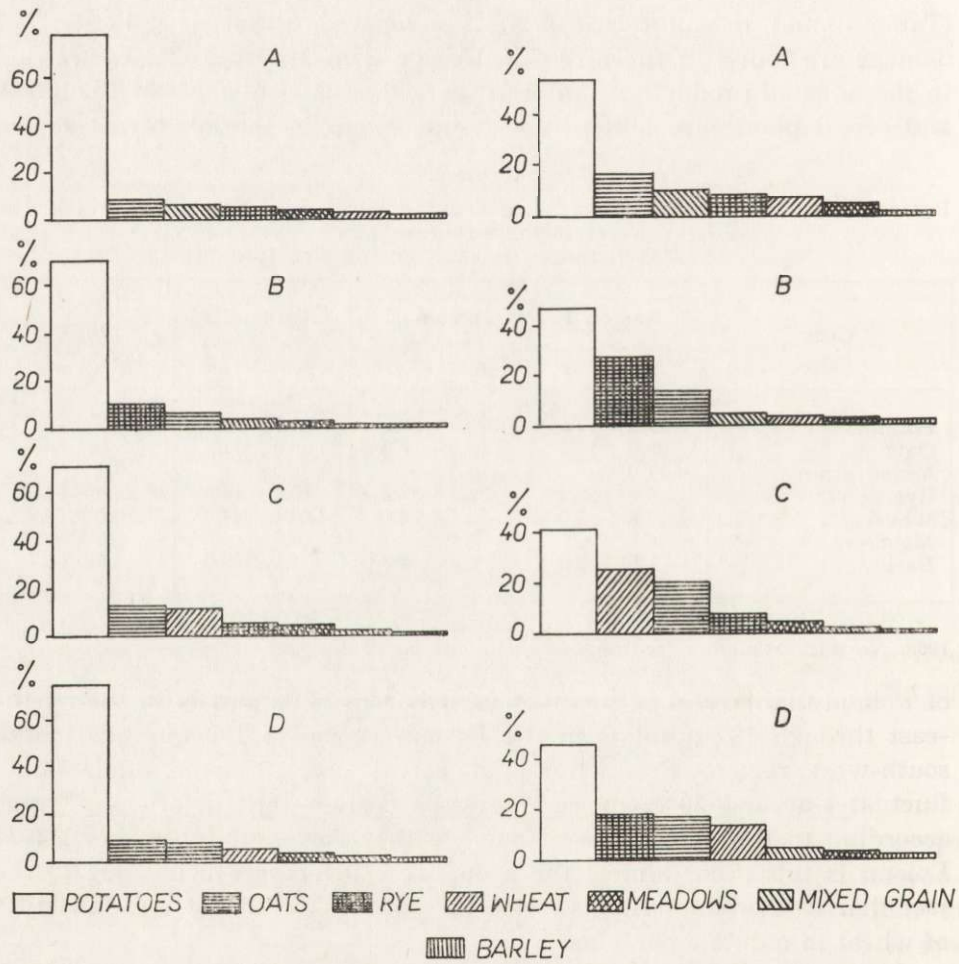


Fig. 4.

Fig. 5.

Fig. 4 & 5. Percentage of damage to agricultural crops expressed in quintals (4) and in Polish currency (5).

money paid as compensation for damage to each crop throughout Poland was calculated. To do so it was necessary to assume the same percentage of damage was done by wild boar to these crops all over Poland as in the study regions. This is justified by the similarity of the crop structure in these regions and throughout of Poland.

Compensation paid for different crops during the study period is shown in Table 5. This was in turn converted into quintals on the basis of prices paid for compulsory supplies of each agricultural product. The value of

Table 5.

Amount of damage done by wild boar in the more important agricultural crops of the whole of Poland (for period 1965—1967).

Crop	In mln zloties	In thousands q	In thousands ha
Potatoes	55	1 060	.0
Rye	20	109	.1
Oats	19	116	5.9
Wheat	15	63	2.
Mixed grain	4	29	.6
Meadows	4	35	1.8
Barley	2	10	0.5
Total	119	1 422	23.7

damage in quintals was calculated per hectare on the basis of productivity per hectare in each crop (Table 5).

5. DISCUSSION

Statistical calculations showed that the relation between amount of damage in different forest districts with the number of wild boar is not significant. Therefore, various other factors such as age and species structure of tree stands and abundance of natural food supply in forests, degree to which the wild boar population is scattered over a group of forests, and many of climatic factors, would appear to greatly influence the degree of destruction in fields adjacent to forests. The degree to which the hunting ground is managed and the accessibility of food in the fields (depending on the configuration of the borderland between forest and field) and its attractiveness also influence this. A greater number of data would perhaps reveal a significant relation between amount of damage and number of wild boar but this relation would probably not be high even then. It is also possible that this relation is significant for lower densities. More extensive investigations and the collection of a larger amount of material would therefore make it possible to state

whether reduction of wild boar would contribute to reduction of damage. This, in turn, would be of assistance in planning wild boar management in different hunting grounds.

Comparison of extent of damage in the study regions in different years, as mentioned before, revealed that damage was greatest in 1967, slightly less in 1965 and least in 1966.

Over the yearly cycle, damages increase from early spring onwards, to attain a peak value during the summer months (when food in the fields is particularly attractive), after which they decrease towards autumn. It is difficult to interpret the slight decrease in amount of damages in June (Fig. 3). This may be due to certain methodical errors which artificially reflect reduced damage during this time, and in consequence to the appearance of curves. Very often the procedure used for drawing up reports on assessment of damage is limited to inspection made twice of damage: the preliminary reports then confirm the occurrence of damage in, for instance, May, and the final reports in July, omitting June. It is not, however, known whether the wild boar did in fact enter the field, or whether the damage was not noticed by the farmer and consequently not reported, especially since the corn crops in fields during this period are very high and it is particularly difficult to notice damage caused in them.

When duration of most intensive damages are compared in three regions of Poland it was found that this period is shortest in region I, slightly longer in region II and longest in region III. These differences are most probably caused by the different duration of the growing season in these regions. The growing season lasts longest and begins earliest in the south-west voivodships (region III), being over 220 days, while it is shortest in the north-east of Poland, and delayed in relation to the other regions (190—200 days), and in region II (Poznań) lasts 210—220 days (Dzięzyć, 1967).

The considerable damage to fields in summer is due to increased food requirements of adult wild boar, accelerated growth rate of young boars, autumn fattening of adults (Andrzejewski & Jezierski, 1969). These investigators showed that in order to prevent damage, wild boar must be supplied with supplementary food during the period in which the damages are most intensified, *i.e.* during the spring-summer period. On account of the different duration of the period of intensified damage and consequently of the period during which wild boar should be given supplementary food, it would seem that it is economically sounder to cultivate wild boar in the north east areas of Poland, where this period lasts only 3 months, than in the south-west areas where the period intensified damage lasts for as long as five months.

Wild boar exhibit particularly marked food preferences for certain

field crops. The present data show that of the cereals, oats are specially preferred. Haber (1969) states that oats are most attractive to wild boar during the early part of the growing season, during the so-called »milk maturity«.

The high percentage of crop damage represented by cereals may also be due to the fact that they are frequently sown in fields after potatoes (particularly in region II) and then wild boar search for the previous year's potato tubers among the cereals. Potatoes in fact occupy one of the highest positions in the order of damages done (this study and Haber, 1969). Haber states (1966, 1969) that potatoes are a very attractive (coming in order after acorn and beech mast) and are hunted for about 6 months, *i.e.*, from the time they are planted in early spring until they are harvested in autumn.

The estimated amount of damages caused by wild boar to each crop for the whole of Poland is only approximate, but indicates the degree to which crops are destroyed by wild boar and suggests the economic impact to be considered in management of wild boar in the country.

Acknowledgement: I would greatly appreciate Dr. Gilbert Dryden, University of Puerto Rico, for his correction and remarks of this article.

REFERENCES

1. Andrzejewski R. & Jezierski W., 1969: Zasady przeciwdziałania szkodom wyrządzonym przez dziki. *Łowiec pol.*, 1 (1340): 4—6 and 2 (1341): 2—3, Warszawa.
2. Boback A. W., 1957: *Das Schwarzwild*. Neumann Verlag: 1—141, Leipzig.
3. Dzieżyc J., 1967: Podstawy rolnictwa. Państw. Wyd. Roln. i Leśn. 1—515, Warszawa.
4. Haber A., 1969: Dzik. Państw. Wyd. Roln. i Leśn., 1—215, Warszawa.
5. Haber A., 1966: Pożywienie dzika. *Łowiec pol.*, 14 (1281): 2—3, Warszawa.

Received, June 13, 1970.

Institute of Ecology,
Polish Academy of Sciences,
Warszawa, Nowy Świat 72.

Regina MACKIN

DYNAMIKA SZKÓD WYRZĄDZANYCH PRZEZ DZIKI W RÓŻNYCH UPRAWACH ROLNYCH

Streszczenie

Celem pracy było uchwycenie prawidłowości w dynamice występowania szkód wyrządzanych na polach przez dziki (*Sus scrofa* Linnaeus, 1758) w rocznym cyklu rozwoju upraw polowych, porównanie wielkości szkód oraz okresów ich nasile-

nia w 3-ch rejonach kraju: południowo-zachodnim, środkowym, północno-wschodnim (Ryc. 1) oraz porównanie wielkości szkód w poszczególnych uprawach.

Badania prowadzono w 19 nadleśnictwach państwowych badanych regionów Polski. W każdym nadleśnictwie zbierano dane dotyczące: 1) wielkości szkód wyrządzonych w latach 1965—1967 wyrażonych w ha tzw. powierzchni zredukowanej, 2) stanu ilościowego dzików w badanych nadleśnictwach a także dane charakteryzujące warunki ostojowe danych terenów i dotyczące składu gatunkowego i wiekowego drzewostanów oraz opadu żołądźi i bukwi.

Wielkości szkód wyrządzonych przez dziki pochodzą z protokółów oszacowania szkód łowieckich. Na podstawie tych danych przeanalizowano rozkład szkód w poszczególnych miesiącach roku w badanych rejonach oraz uchwycono okres ich największego nasilenia. Ponadto obliczono procentowy udział ważniejszych upraw w szkodach, wyrażonych w ha powierzchni, w q i w złotychkach. Korzystając z tego ostatniego oraz sumy wypłaconej za odszkodowania oszacowano wartość szkód w tych uprawach w całym kraju (Tabela 5).

Spróbowano ocenić zależność między wielkością szkód w poszczególnych nadleśnictwach a ilością dzików. Obliczony współczynnik korelacji $r = 0,24$ wskazuje, że jest to zależność w pobliżu granicy istotności.

Porównując wielkości szkód w różnych miesiącach roku stwierdzono, że szkody wznoszą się od wczesnej wiosny i osiągają szczytową wartość w miesiącach letnich, poczyn na jesieni maleją (Ryc. 3). Jest to ogólna prawidłowość w 3-ch badanych latach. Porównanie długości okresu nasilonych szkód w 3-ch badanych rejonach, pozwala stwierdzić, że najkrótszy jest on w rejonie I, nieco dłuższy w rejonie II, a najdłuższy w rejonie III. Jest to spowodowane różną długością okresu wegetacyjnego w wymienionych rejonach.

Różna intensywność szkód w ważniejszych uprawach rolnych (Tabela 4) wskazuje na istniejącą u dzików wybiórczość pokarmową. Szczególnie preferowanym jest owies, zwłaszcza w okresie dojrzałości mlecznej i ziemniaki. Wysoki udział ziemniaków w szkodach częściowo jest związany z dłuższym okresem dostępności ich w stosunku do pozostałych upraw.