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Longevity and Mortality Rate in a Population of Wild Boar

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Jezierski W., 1977: Longevity and mortality rate in a population of wild boar. Acta theriol., 22, 24: 337—348 [With 4 Tables & 1 Fig.].

During the period from 1963—1973 individually marked wild boar (*Sus scrofa* Linnaeus, 1756) were frequently caught in the Kampinos National Park near Warsaw (N=376). The mortality rate of piglets was estimated as 15% of the young born, and the number of wild boar from 2—5 years old leaving the area due to emigration as 12—32%. Maximum (9 years) and average (males 21 months, females 24 months) length of life of wildboar was estimated from lifetime tables. The survival curve was exponential in character. Mortality rate was higher among males during the first three years of life and lower above the sixth year, than in the case of females. Life expectancy was greatest (25 months) in the case of wild boar which had survived up to the fourth year of life. The seasonal course of mortality was described for two groups differing in this respect: animals up to one year old and animals over one year old.

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1. INTRODUCTION

Definition of the longevity of individuals and analysis of mortality in a population of free-living animals form a basis for drawing conclusions as to the course taken by processes of variations in numbers and population production. These parameters have been determined in detail only for a small number of animal species, and in the case of large free-living mamals the species concerned are in principle the mountain sheep *Ovis canadensis dalli* Nelson, 1884 (Deevey, 1974), the Canadian deer *Odocoileus hemionus columbianus* (Richardson, 1829) (Taber & Dasman, 1957) and the roe-deer *Capreolus capreolus* (Linnaeus, 1821) (Strangaard, 1972). There are no similar data for wild boar, *Sus scrofa* Linnaeus, 1758.

Only fragmentary data can be found in relevant literature on maximum longevity of the wild boar (Caboń, 1959; Brandt, 1961), mortality of young wild boar (Lebedeva, 1956) and the age structure of populations (Andrzejewski & Jezierski, 1978). The fairly numerous discussion of these questions in hunting literature based on hunters'

traditional opinions or on the authors' theoretical argumentation are not unfortunately supported by reliable documentation.

The purpose of the present study is to describe mortality in a definite population of wild boar and in particular to ascertain the maximum and average length of life of these animals, mortality rate of males and females and seasonal variations in mortality in different groups of these animals.

2. MATERIAL AND METHODS

The studies were based on data on the life history of 376 individually marked wild boar, which were repeatedly caught (Table 1), for which the time of birth and natural disappearance from the study population were recorded. These wild

Table 1

Basic material (excluding piglets but including emigrants).

Age, years	Number of wild boar living at the start of each year of their life	Number of wild boar disappearing from the study area during each year of their life
1	376	130
2	246	166
3	80	39
4	41	13
5	28	10
6	18	12
7	6	3
8	3	2
9	1	1

boar were chosen from a total number of 593 marked and caught animals, 55 of which were still alive at the time the studies ended, and consequently the age at which they disappeared from the population was unknown, and 162 individuals shot. Shooting of these wild boar was in principle confined solely to the first two age classes (1—2 years old), but none of the animals excluded from the wild boar material presented had exceeded the maximum age of the individuals on which this study was based.

The studies were made in the Kampinos Park near Warsaw during the period from 1965 to 1975, and in addition the life histories of 15 individuals which were born and marked between 1962—1965 in connection with other studies in this area were also taken into consideration.

The *CMR* method was used and the data obtained elaborated by means of the calendar of captures method (Andrzejewski, 1969). The method employed in these studies has been described in detail by Andrzejewski & Jezierski (1978).

3. RESULTS

3.1. Mortality among Piglets and Emigration

Newborn young of the wild boar do not begin to appear on trapping sites until the sixth to eighth week of life (that is, during the second half of May) and complete marking of these individuals ended in August.

The method employed did not therefore permit of tracing mortality among those animals during the first three months of life or of ascertaining the total number of young born. Data on mortality of young pigs in July are also burdened with some degree of error, although this is slight, since marking of newborn animals is completed by the end of this month.

In one year (1966) it proved possible to estimate mortality rate among piglets and define the total number of young born. The number of young animals and number of extended teats were counted for each sow caught with her young for the first time. As each piglet has its own teat in the mother's udder the difference between the number of extended teats and number of living piglets at the time of their first arrival on the trapping site after their birth gives the number of sucking pigs which had died before capture and recording for the first time. This difference was 15% of the total number of young born and differs very little from the findings of F o r m o z o v (1952), who defined the mortality rate of piglets during the first three months of life as 20% of the number of young born.

The climatic and food conditions during the second half of 1965 and first half of 1966, that is, a period capable of influencing reproduction and the first months of life of young wild boar born in 1966 were average for the study area. A general correction for mortality rate of piglets was therefore taken as 15% of the total number born (376 : 85 × 15 = 66 piglets).

The calendar of captures method defines the time of disappearance of each individual from the population, but does not solve the question as to whether disappearance took place as the result of the individual's emigrating from the study area or of its death (excluding those found dead although these were few in number). It was therefore necessary to estimate how many of these animals disappear from the population through emigration. It was assumed that this value should be in proportion to the number of immigrants which entered and settled in the study area during the course of the studies. The material collected made it possible to allow for division into age and sex classes. It was found that it is only wild boar from two to five years old which settle in the area,

as follows: in the 2-year-old class: about 12%, three year old — about 21% and four- and five year old — about 32%. The ratio of males to females among the settlers is 1 : 2 in the 2-year old class, and 1 : 1.5 in the other three age classes. Calculation was made on this basis of the correction to the lifetime table (Table 2), eliminating from the table individuals of the respective age and sex classes which had emigrated from the area. The assumption made may possibly not be completely correct and the extent of emigration by wild boar which subsequently survived the migration period, may have been slightly higher than the immigration of settling animals, on account of the high density during a certain period of the study population. It is, however, the only possibility of bringing the results obtained close to the true situation in the population.

Table 2

Life table of wild boar.

Age	Number surviving at beginning of interval	Number dying in given interval	Mortality rate, %	Life expectancy in months
X	l_x	d_x	$q_x = \frac{d_x}{l_x} 100$	$e_x = \frac{\sum_{t=x}^{t>x} t}{l_x}$
1	407	196	48.2	17
2	211	146	69.2	15
3	65	31	47.7	15
4	34	9	26.5	25
5	25	7	28.0	19
6	18	12	66.6	13
7	6	3	50.0	14
8	3	2	66.6	10
9	1	1	100.0	6

3.2. Maximum and Average Longevity

The maximum age of wild boar living in a natural habitat had been defined by means of craniological material, *inter alia* by Cabon (1959), as approximately 12 years, and by Brandt (1961) as 13 years (for males).

The oldest male recorded in the studies presented here had reached the age of 9 years (survived for 100 months). The oldest female had survived 91 months (8 years). Therefore, although it is probable that the wild boar may reach the age of 12—13 years, this will apply only to sporadic cases, and it may be considered that in the majority of cases the maximum longevity of wild boar will come within limits of 9—10 years.

The average length of life of wild boar all the animals examined was 23 months. Males exhibited a lower average length of life than the general average — 21 months, and females a higher — 24 months. If this lifetime is calculated for wild boar over three months old, that is, without mortality among piglets, then it becomes slightly longer and is 25 months for the whole population, 23 months for males and 27 months for females.

3.3. Mortality Rate

The short average length of life of the wild boar is due to the generally high, and during the first two years of life (before the animals enter the reproduction period) very high, mortality rate. During the first period of life about 84% of the young born die, 48% of this number during the first year of life (Table 2) and about 36% during the second year.

If we consider mortality during the first two years of life, after excluding mortality among piglets (which is often done in ecology and demography), it will be found that the relevant index changes only slightly and will be about 81% of the animals born. The percentage of deaths during the first year of life, however, distinctly decreases in this case — to about 38%, and mortality during the second year rises to about 43%.

This provides grounds for the statement that mortality among wild boar piglets is of relatively little significance to the life of the whole population, but significantly affects the quantitative relations in age class I (one year old). The mortality of animals over one year old is of particularly great importance to the future of the population, but mortality in the third year of life, although very high (Table 2), is not by then of great importance, (about 8%).

These data are similar to those obtained by L e b e d e v a (1956), who found that in the Białowieża Primeval Forest on an average about 40% of the wild boar die during the first year of life, but during a year with abundant food this figure is only about 10%, and in years with difficult weather conditions and poor food supply as many as 80—90% of the young pigs die.

Mortality rate in wild boar differed in the different age classes (Table 2). The first three age classes were characterized by high mortality, but during the fourth and fifth year of life mortality decreased, then rose again steeply as from the sixth year of life.

Females and males were characterized by a differential mortality rate (Table 3), mortality being higher among males during the first four

years of life than among females. As from the sixth year of life females died more quickly than males. This situation did not differ from similar regularities found in other species of mammals.

Table 3

Mortality rate of males and females.

Age, years	Males	Females
1	49.0	47.2
2	72.9	65.4
3	65.5	33.3
4	30.0	25.0
5	28.6	27.8
6	60.0	69.2
7	0.0	75.0
8	50.0	100.0
9	100.0	—

3.4. Seasonal Character of Mortality

Distribution of mortality over the yearly cycle exhibited significant differences, differing also for wild boar during the first year of life and or those more than one year old (Table 4). Contrary to what is generally believed by hunters, the winter period (December, January and

Table 4

Seasonal distribution of mortality among wild boar.

Months	Up to 1 year old	Older than 1 year
April	66	28
May		28
June		25
July	3	16
August	14	21
September	11	29
October	30	18
November	25	8
December	12	16
January	4	9
February	11	10
March	20	3

February) was characterized by low mortality among piglets (14% of those dying during the course of a year). If mortality among piglets is excluded, then only 21% of young pigs died in winter. In the class of wild boar over one year old, only 22% of total mortality for the whole year occurred during the late autumn and winter period (from November

to March). In general it may be said that winter is a period favourable to the wild boar population, since mortality is then lower than average.

The following two periods were least favourable to survival of young pigs: (1) during the first three months after birth when about 34% of the animals died, (2) during the two autumn months — October and November — in which about 28% of young pigs died (if mortality among piglets is excluded this value rises to about 42%). In addition a certain smaller increase in mortality took place in March.

The spring period was least favourable to wild boar over one year old, since about 38% of the individuals died at that time. The remaining four months of the year, that is, outside the period defined as most favourable, was characterized by high mortality, only slightly differing from that of the spring months.

4. DISCUSSION

In the picture of the life and mortality of wild boar the very high mortality rate during the first years of life, combined with high natality, is very striking (Lebedeva, 1956; Andrzejewski & Jezierski, 1978). This is a phenomenon not encountered in other large precocious mammals, outside the *Suidae* family. For instance in the mountain sheep mortality during the first year of life is about 20%, but is scarcely 2% during the subsequent three years (Deevey, 1947). In the roedeer mortality is about 36% during the first year of life, but does not reach 10% during the following six years (Strangaard, 1972). In the case of the wild boar only 8% of those born survive the first three years.

This extent of mortality among wild boar is, however, astonishingly similar to the data for hares (Petrusewicz, 1970). Mortality during the first year of life is of greater significance in the hare, since about 28% of the animals survive the first year, while in wild boar this figure is 52%. This difference is balanced by the second year (in the case of hares 12% of the animals survive this year, and 16% of wild boar). Since females begin reproducing in their second year of life and produce young at the time they themselves reach the age of two years, while female hares begin as early as towards the end of the first year of life or beginning of the second year, the reproduction dynamics of these two species is very similar. In relation to this similarity the opinions put forward that from the phylogenetic aspect the hare is closer to ungulates than to rodents, deserve mention (cf. Sych, 1966).

The very low mortality rate among wild in winter is also interesting, although this is not the only instance of such a phenomenon. Similar

regularities have been described for the hare by Pielowski (1968) and Petrusewicz (1970), and for the bank vole by Petrusewicz *et al.* (1969).

As the mechanisms responsible for seasonal mortality distribution of this kind were unknown it was assumed that it is characteristic of populations in which the main mechanism controlling numbers are of biocenotic origin. The pressure of these factors on populations is sufficiently lessened during the winter period (*e.g.* by the decrease in predator pressure on populations of small rodents living under the snow cover, or extinction of epizooties and invasive diseases in hare populations during the winter season), to more than compensate for the increased losses due to more difficult weather or food conditions. It has also been assumed that in the case of populations of large animals controlled primarily by intrapopulation systems, the winter situation should only cause deterioration in living conditions.

In the case examined this was found not to apply. Although the population described was in a particularly favourable food situation due to constant supplementary supply of food (Andrzejewski & Jezierski, 1978), absence of supplementary feeding did not cause any food deficiency (Jezierski & Myrcha, 1975).

The lower mortality rate among wild boar during the winter period is not a rule to which no exception occurs. Andrzejewski & Jezierski (1978) showed that in the winter of 1969/70, as the result of an exceptionally deep snow cover preventing the wild boar from moving about freely to obtain food, mortality was very high in this population.

To sum up the above discussion it may therefore be said that under average living conditions for the population the winter period is the most favourable from the aspect of survival. When weather conditions occur which differ decidedly from the average, winter may be a period of increased mortality, which is capable of being prevented by intensive supplementary feeding, as has been shown by Andrzejewski & Jezierski (*l.c.*).

The distributions of mortality presented in this study provide grounds for putting forward certain assumptions as to their causes. Mortality among piglets is probably due to the fact that the mechanisms of physiological adaptation are not as yet fully formed. Studies have shown that the capacity for thermoregulation forms within approximately one month (Myrcha & Jezierski, 1972) and the young animals may not be adapted to withstand April ground frosts. It is only during this period that the capacity of the blood to carry oxygen develops (Kostelecka-Myrcha, 1974).

The autumn rise in mortality among young wild boar is probably due to three coinciding causes, which are as follows: (1) development of the first winter coat, which causes great increase in basic metabolic rate of energy and reduction in the organism's thermal isolation due to marked congestion of the hair papillae, (2) occurrence of the first autumn cold weather and increased humidity and (3) development of parasites of

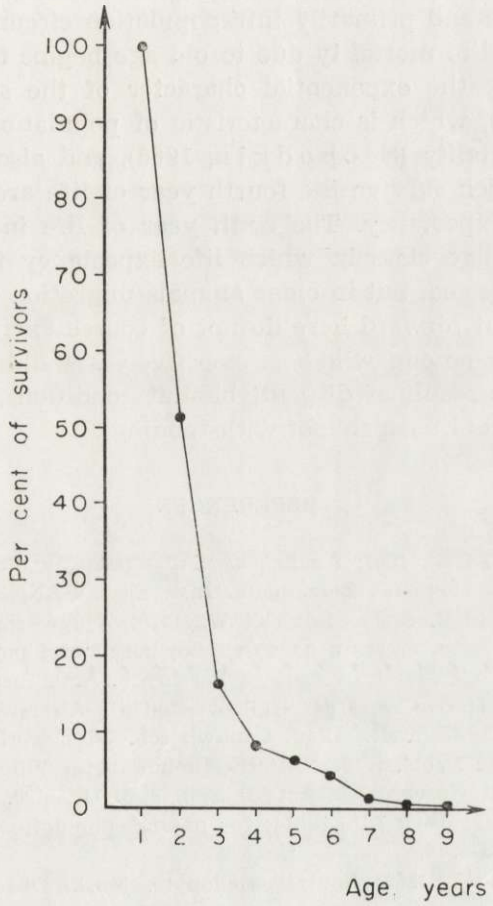

Fig. 1. Population survival curve.

the lungs and alimentary tract. Frączak (1974) has drawn attention to the connection between increased invasion of parasites and mortality among young wild boar.

The March increase in mortality among these young animals is probably due to their being deserted by their mothers, which are preparing for the birth of their next progeny. The relatively balanced mortality

during the period from April to October in wild boar over one year old would appear to point to the strong influence of intrapopulation factors. Some degree of peak mortality in spring and in September may be connected with change of coat. The increased mortality among wild boar in December is probably due to fights among mating males.

In the light of these observations it would appear that during the first five years of life in wild boar the chief causes of death are due to habitat, biocenotic and primarily intrapopulation circumstances. As from the sixth year of life mortality due to old age begins to predominate, as is shown both by the exponential character of the survival curve for wild boar (Fig. 1), which is characteristic of populations with an ecological type of mortality (Slobodkin, 1966), and also by the fact that the wild boar which survive the fourth year of life are characterized by the longest life expectancy. The sixth year of life in the case of wild boar is the first age class in which life expectancy is lower than the average for this period, but in older animals migration was not observed. The arguments put forward here do not of course exclude the ecological basis of mortality among wild boar over five years old (*e.g.* death of old individuals as the result of difficult habitat conditions, which wild boar of middle age are quite capable of withstanding).

REFERENCES

1. Andrzejewski R., 1969: Analiza wyników połowów drobnych ssaków metodą „kalendarza złowień". Zesz. nauk. Inst. Ekol. PAN, *2:* 1—104. Warszawa.
2. Andrzejewski R. & Jezierski W., 1978: Wpływ zmiany struktury wiekowej i dodatkowego pokarmu na dynamikę liczebności populacji dzików i powodowane przez nią szkody w uprawach rolnych. Acta theriol. (in print).
3. Brandt E., 1961: Der Wert der Keilerwaffen als Altersweiser. Beitr. Jagd.-u. Wildforsch. 1, Tag.-Ber. dt. Akad. Landwirtsch.-Wiss. Berlin, Nr. 37: 53—77.
4. Caboń K., 1959: Problem der Alterbestimung beim Wildschwein (*Sus scrofa* L.) nach der Methode von Dub. Acta theriol., 3, *8:* 113—120.
5. Deevey E. S. Jr., 1947: Life tables for natural populations of animals. Quart. Rev. Biol., *22:* 283—315.
6. Formozov A. N., 1952: Sputnik sledopyta. Mosk. Obšč. Isp. Prir.: 1—356. Moskva.
7. Frączak K. 1974: An attempt at determining the role of parasites as a factor controlling the number of a wild boar (*Sus scrofa*) population. Wiad. parazyt. *20,* 5: 747—749.
8. Gidley J. W., 1912: The Lagomorphs an independent order. Science. n. s., *36:* 285—286.
9. Jezierski W. & Myrcha A., 1975: Food requirements of wild boar population. Pol. ecol. Stud., *1,* 2: 61—83.
10. Kostelecka-Myrcha A., 1974: Changes in hematological values in wild boar during postnatal development. Acta theriol., *19,* 1: 165—176.

11. Lebedeva A., 1956: Ekologičeskie osobennosti kabana Belovežskoj Pušči. Uč. Zap. Mosk. Gorod. Ped. Inta., *61:* 105—271.
12. Myrcha A. & Jezierski W., 1972: Metabolic rate during postnatal development of wild boars. Acta theriol., *17*, 33: 443—452.
13. Petrusewicz K., 1970: Dynamics and production of the hare population in Poland. Acta theriol., *15*, 26: 413—445.
14. Petrusewicz K., Andrzejewski R., Bujalska G., & Gliwicz J., 1969: The role of spring, summer and autumn generation in the productivity of free-living population of *Clethrionomys glareolus* (Schreber, 1780). [In »Energy flow through small mammals populations«. Eds K. Petrusewicz, L. Ryszkowski]. Polish Sci. Publ.: 235—245. Warszawa.
15. Pielowski Z. 1968: Die Jahresbilanz einer Hasenpopulation in Polen. Beitr. z. Jagd.-u. Wildforsch. 6: Tag.-Ber. gt. Akad. Landwirtsch.-Wiss. Berlin Nr 104, 129—137.
16. Slobodkin L. B., 1966: Growth and regulation of animal populations. Holt, Rinechard, Winston: 1—174. New York.
17. Strangaard H., 1972: The roe deer (*Capreolus capreolus*) population at Kalö and the factors regulating its size. Danish Rev. Game Biol., *7*, 1: 1—205.
18. Sych L., 1966: Czy przodkami zająca były ssaki kopytne. Przegl. zool., *10*, 1: 65—71.
19. Taber R. D. & Dasman R., 1957: The dynamics of three natural populations of the deer, *Odocoileus hemionus columbianus*. Ecology, *38:* 233—246.

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CZAS ŻYCIA ORAZ WIELKOŚĆ I SEZONOWOŚĆ ŚMIERTELNOŚCI W POPULACJI DZIKA

Streszczenie

W Kampinowskim Parku Narodowym koło Warszawy, w latach 1963—1973 łowiono wielokrotnie uprzednio znakowane dziki (*Sus scrofa* Linnaeus, 1758) (N=376) (Tabela 1), których daty urodzenia i ubycia z badanej populacji były znane. Oszacowano wielkość śmiertelności oseskowej i liczbę osobników ubywających na skutek emigracji. Następnie zestawiono tabelę życiową i oceniono maksymalny i średni czas życia, charakter krzywej przeżywania, tempo wymierania samców i samic, dalszy oczekiwany czas życia osobników z poszczególnych klas wiekowych oraz sezonowość śmiertelności dzików z dwóch różniących się przebiegiem tego zjawiska grup wiekowych — warchlaków i dzików starszych niż jeden rok.

Stwierdzono, że maksymalny wiek osobników wynosił 9 lat, zaś średni wiek samców 21 a samic 24 miesiące. Krzywa przeżywania dzików ma przebieg wyraźnie wykładniczy (Ryc. 1), co wskazuje na ekologiczny charakter zasadniczych przyczyn śmiertelności. Tempo wymierania populacji, ogólnie wysokie, jest szczególnie duże w pierwszych trzech latach a od szóstego roku wzwyż jeszcze się zwiększa (Tabela 2). Samce wymierają szybciej w pierwszych czterech latach a

od szóstego roku wolnej niż samice (Tabela 3). Najdłuższy dalszy oczekiwany czas życia — 25 miesięcy (Tabela 2) — mają dziki, które osiągnęły 4 rok. Najbardziej korzystnym ze względu na przeżycie jest: dla warchlaków okres zimy od grudnia do lutego (około 14% rocznej śmiertelności), a dla dzików starszych schyłek jesieni i zima od listopada do marca (około 22% rocznej śmiertelności) — (Tabela 4). Najmniej korzystnym okresem jest: dla warchlaków październik i listopad (około 28% rocznej śmiertelności) i dla starszych dzików czas od kwietnia do czerwca (około 38% rocznej śmiertelności).