BIRTH DISTRIBUTION, STRUCTURE AND DYNAMICS OF A HUNTED MOUNTAIN POPULATION OF WILD BOARS (Sus scrofa L.*), TICINO, SWITZERLAND*

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Abstract: Wild boars killed during the hunting seasons 1988-1992 were aged from tooth-eruption and tooth-wear. A monthly birth distribution and an age and sex pyramid were built. Births take place throughout the year, though about 83% are concentrated between February and August. The remaining 17% occurs between September and January. The pyramid of the age classes of the population typically agrees with that of a hunted population, so that the first two age classes (0-1 and 1-2 years) depict 82% of the population. On the grounds of these results and according to other studies, a few conclusions are inferred regarding the demographic increase of hunted populations.

Keywords: Wild boar, *Sus scrofa,* Suidae, Population dynamics.

IBEX J.M.E. 3:192-196

1. Introduction

The population of wild boars in Ticino (Swiss Canton, south of the Alps) is very recent. The first animal was recorded at the beginning of the 80's in a region called Malcantone, on the border with the Lombardic Alps region (Italy). In subsequent years the population quickly spread northwardly and increased significantly (Baettig, 1985; Moretti, 1991; Moretti, 1992). After the appearance of this species in the study area eight years ago and from the first huntig season in 1988, a study was accomplished based on hunted animals in order to analyse some important aspects of the population's structure and dynamics.

2. Study area

The Malcantone region (Southern Switzerland) covers an area af 7,000 ha with a southern orientation; altitudes range from 200 to 1,800 m u.s.l. (Fig. 1). The annual rainfall is 1,700 mm (mean for the last 30 years). The environment is as follows: wood 60%; urbanized area 15.5%; agricultural area 10.5%, alpine meadows 10%; uncultivated land 4%. The chestnut *(Castanea sativa)* predominates between 200 and 1,000 m u.s.l., pure or mixed with beech *(Fagus sylvatica)* or with oaks *(Quercus sp.)*. In the study area, the species has found optimal environmental conditions (Moretti, 1991).

3. Methods

3.1. Sex and age ratio

During the hunting season of 1990-91, 521 wild boars were killed and examined. All animals were shot in the Malcantone region (Ticino, Switzerland) between 200 and 1,600 m above sea level. The hunting code did not provide any special restriction and all age classes were therefore present in the analysed samples. Some animals were aged from tooth-eruption and tooth-wear according to Iff (1978), whose age classes were adapted from the recent works of Boitani & Mattei (1992) and Genov *et al.* (1992) in accordance with Matschke (1965). The sex ratios were compared with the theoretical distribution 1:1 (Chi-square test).

3.2. Natality, birth distribution and static life table

The uteri of 17 females were analysed and the number of foetuses were counted. The monthly birth distribution of 320 wild boars between 6 and 18 months of age was calculated.

The life table distributed into age classes was etablished in accordance with Blant (1987) and Henry and Conley (1978). Even if hunting is considered the main cause of mortality of hunted populations (Baettig, 1988), the limits of the hunting techniques are unknown. Nevertheless it is worth a discussion and a comparison with the results of other studies.

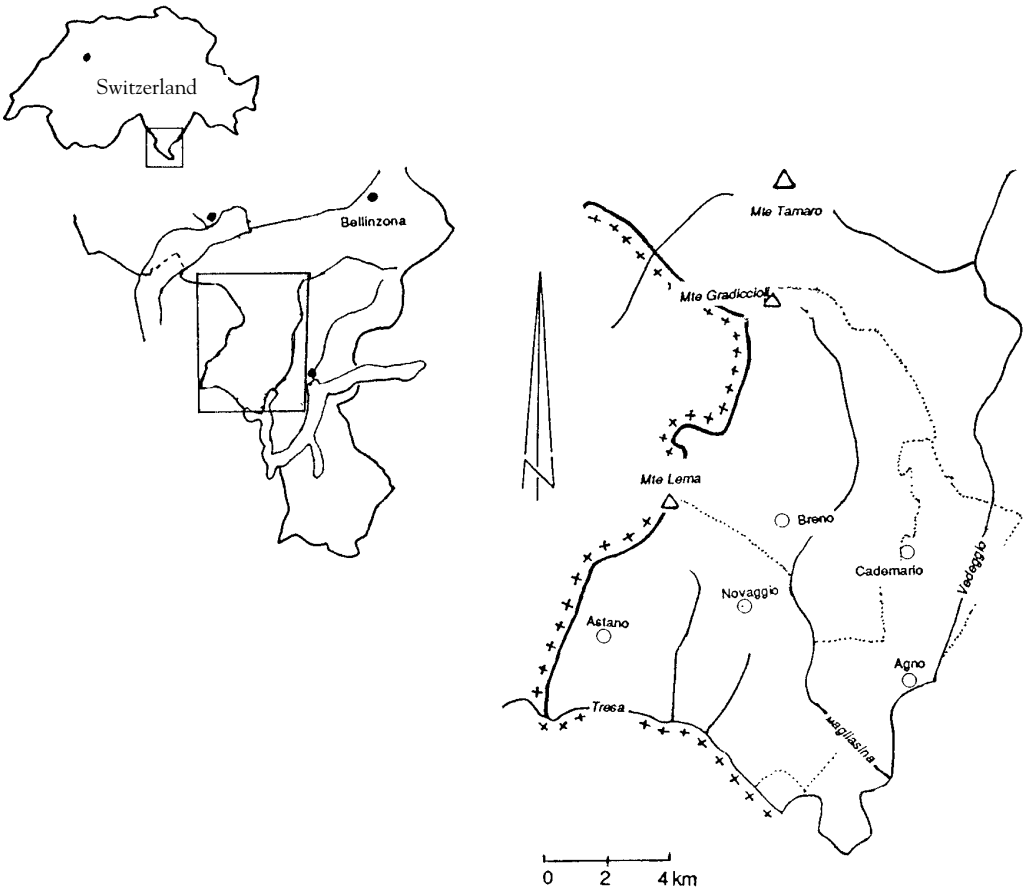

Figure 1. Study area

Different parameters have been considered as follows:

- x : age class
- l : number of animals of 'x' age from the hunted sample
- l_x: number of animals of 'x' age from an initial population of 1,000 individuals
- d_x: number of dead animals between 'x' and 'x + 1' and thus: $d_x = l_x - l_{(x+1)}$
- q_x: mortality rate: d_x / l_x)
- p_x: survival rate $(1 - q_x)$
- e_x: mean expectation of life remaining.

4. Results

4.1. Sex and age ratio

Figure 2 indicates the percentage distribution of the different age classes for both sexes. The result is a symmetric pyramid whose base consists of 46% of animals aged 0-1 years (class 1) and of 36% of animals aged 1-2 years (class 2). If added, these two classes (from 0 to 2 years) represent 82% of the population. Animals older than 2 years only represent the 18%. In the sample the sex ratio is balanced in all age classes (mean: 0,98).

4.2. Natality, birth distribution and static life table

The results of the analysis of 17 uteri appear in Table 1. The mean number of foetuses is 4.8 per pregnant female. In this sample, five out eight females in the age class 0-1 year (class 1) and all females in other classes take part to the reproduction.

The births occur throughout the year, though about 83% are concentrated between February and August (Fig. 3). During this period it

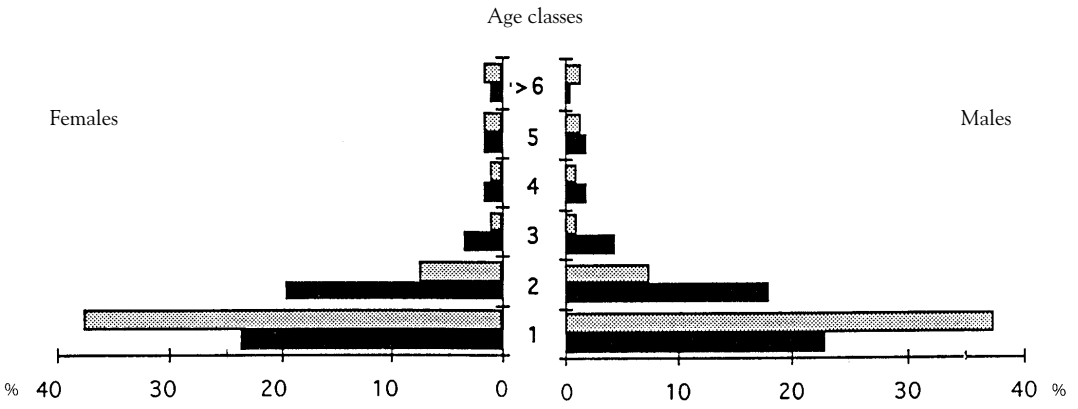

Figure 2. Composition in age classes and sex of shot population of Wild boar (n = 521). Black = real age-rate of the studied population; Grey = theoretical age-rate.

Table 1: Number of foetuses per female (n=17) per age class.

	Number of foetuses per female									Pregnant females	Mean of foetuses per pregnant female		
Age classes (years)	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**(%)**	MORETTI (n = 17)	**BRIEDERMANN (n = 251)**	**BAETTIG (n = 39)**
0-1	3			4				1		63%	3,8	4,0	4,7
1-2				1		1	2	1		100%	5,4	5,5	6,1
> 2					1	1	1		1	100%	5,7	6,6	7,3
TOTAL	3	-	-	5	1	2	3	2	1		4,9	5,3	5,6

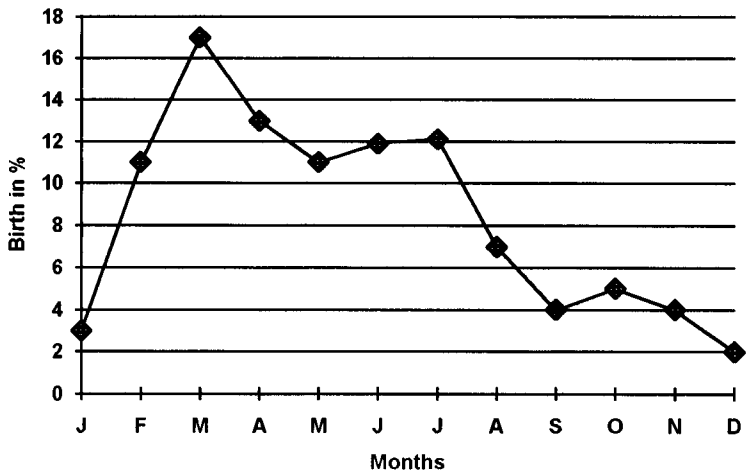

Figure 3 - Monthly birth distribution (in %) according to the age at the killing (n = 320).

Table 2: Static life table based on 521 wild boars shot in study area between 1990 and 1991. x: age classes; l: number of animals in 'x' age class from the hunted sample; l_x: number of animals of 'x' age from an initial population of 1,000 individuals; d_x: number of animals shot beween 'x' and 'x+1' and thus $[l_x - l_{(x+1)}]$; q_x: mortality rate (d_x/l_x); p_x: survival rate ($1-q_x$); e_x: survival chance (T_x/L_x), where $L_x = \{l_x + l_{(x+1)}\}/2$ and $T_x = \sum L_x$.

Survival table						Static life table				
x	l	l_x	d_x	q_x	p_x	d_x	l_x	L_x	T_x	e_x (in months)
0-1	241	1000	220	0.22	0.78	220	1000	890	1363	1.53 *(18 months)*
1-2	188	780	614	0.79	0.21	614	2791	473	598	1.26 *(15 months)*
2-3	40	166	83	0.50	0.50	83	377	124	203	1.63 *(20 months)*
3-4	20	83	8	0.10	0.90	8	38	79	139	1.76 *(21 months)*
4-5	18	75	29	0.39	0.61	29	132	60	89	1.48 *(18 months)*
5-6	11	46	33	0.73	0.27	33	151	29	35	1.21 *(14 months)*
6-7	3	12	12	1.00	0.00	12	57	6	6	1.00 *(12 months)*
> 7	0	0	0			0				
	521	2162								

seems that the number of births follows a bi-modal distribution with a peak in March and one other between June and July. The remaining 17% are distributed, more or less regularly, between September and January, with minimal values between December and January.

Table 2 shows some important parameters of the population dynamics of a sample of 521 shot wild boars. The *mortality rate* per classe follows an alternate movement with minimum values at 0-1 and 3-4 years (10-22%), and maximal values at 1-2 and 5-6 years (73-79%). The *mean expectation of life remaining* in the single classes of the analysed population is higher in the classes between 2 and 4 years (e_x=20-21 months) compared to the younger and to the older ones (e_x=12-18 months). These values never go over two years, which represents the mean value of the turn-over of the population.

5. Conclusions

5.1. Birth distribution

The birth distribution agrees with that presented by other authors (Briedermann, 1986; Baettig, 1988; Gerard *et al.*, 1991; Durio *et al.*, 1992) and also agrees with the hypothesis on the females' winter estrus, which in this case happens between November and March. The long period of births and the bi-modal movement between February and July suggest, nevertheless, that the female oestrus is barely synchronized (Meriggi *et al.*, 1988; Gerard *et al.*, *op. cit.*; Mauget *et al.*, 1984). The favourable environmental conditions and the abundant availability of suitable food in the study area (Moretti, 1991) could confirm Mauget's hypothesis (1980) according to which wild boars react to increased food availability switching from one farrowing period (April) to two periods (January - February and July - August). This hypothesis is also confirmed by Durio *et al.* (*op. cit.*). On the other hand the lost of the nestling during particularly rainy springs brings the females to a new oestrus, which has a period of 21 days (Mauget *op. cit.*; Gerard *et al.*, *op. cit.*).

5.2. Population structure, survival & mortality rates and hypothesis on the dynamics of hunted populations

The structure of the sampled population is the same as that of several populations hunted in Europe and shows the symptoms of a quite superficial management (Briedermann, *op. cit.*; Meriggi *et al.*, *op. cit.*). The mortality rate in hunted populations during the first year is very low compared to natural ones even when they are characterized by low mortality among young animals (Jezierski, 1977; Andrzejewski & Jezierski, 1978, in Briedermann, *op. cit.*). From the second or third year on the movement and the values become closer to those of a natural population.

One important aspect, which is connected with such a management is the increase of the population size. Actually, in normal environmental conditions, about 40% of younger

females (0-1 years) take part in the reproduction, with an average of 4 offspring (Briedermann, *op. cit.*).
The ecological-environmental conditions in the study area are good, especially the trophic ones (Moretti, 1992). From the climatic point of view, the situation is mostly good, although it is not known how much particularly rainy springs affect the natural mortality of younger animals. If hunting is the most significant reason of mortality among Wild boar (83%, Baettig, 1988) then it is possible to predict that the population will increase in the next few years. In case of massive migration towards the neighbouring Italian regions, local hunting statistics would not be able to show this fact directly. Therefore the coordination of studies and the management of populations between neighbouring confined regions (in the studied case between north-italian regions and southern parts of Switzerland) should be improved.

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