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DIET OF THE WILD BOAR (Sus scrofa L.*) INHABITING THE MONTPELLIER GARRIGUE*

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Abstract: We studied the diet of the Mediterranean Wild boar in two successive years, by analyzing 82 stomach contents collected during the hunting season (September-December) and 138 feces collected near feeding troughs during the rest of the year. The samples came from animals inhabiting a typical Mediterranean garrigue characterized by holly oak (*Quercus ilex)* and situated at the edge of the extensive vine-growing plain of the Hérault department. Food-habits analyses using feces and stomachs sampled during the same period yielded comparable results. The Wild boar is omnivorous, with a definite frugivorous tendancy. Plants represent 96% of the diet. The animal part (3%), however, is underestimated since snails and earthworms are quickly digested. A special investigation of the presence of mollusc mouth pieces and earthworm setae allowed us to calculate the number of individuals consumed. Wild fruits represent 57% of the annual diet, in dry weight. Among fruits holly oak acorns are the staple food (47% in dry weight over the year) and they are consumed as soon, and as long, as available. The amount of artificial food (*Zea mays)* is important (32% of the annual diet). Comparison of good and poor mast years showed that Wild boar may compensate a lack of acorns by feeding on grapes in the vineyards.

Keywords: Wild boar, *Sus scrofa*, Suidae, Feeding habits, Food resources, Stomach contents, Feces, France, Europe.

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1. Introduction

Several Wild boar diet studies have been carried out in France by Conner (1982), Douaud (1983), Dardaillon (1984) and Sjarmidi (1992), but nothing has been reported on food habits over the annual cycle, because of the methodological problems underlying this type of study (Gerard & Campan, 1988). Elsewhere, authors reported on Wild boar food habits throughout the year (Briedermann, 1986; Genov, 1981a; Genov, 1981b; Palata *et al.*, 1987), but only in deciduous forests.

For several years Wild boar populations have been decreasing in the southwestern part of France. Nevertheless, vineyard growers are filing more and more request for financial compensation owing the Wild boar damage. Therefore, an in-depth study of the Wild boar diet over the yearly cycle, linked to an analysis of their seasonal habitat use, is needed for a better understanding of environment/Wild boar interactions. Such data are necessary for developing ways of reducing depredations on vineyards.

2. Study area

The study area is situated in the Hérault department, 35 km north-west of Montpellier (France) (Fig.1), at the junction of two contrasting areas: the vineyards of the Hérault plain and the garrigue.

In the Hérault valley (236,000 ha), 66% of the agricultural land is occupied by vineyards. Other vegetation types include olive groves (*Olea europaea*), almond groves (*Amygdalus communis*), fallow land, small woodlands and riparian woods. The garrigue (500,000 ha) is an area covered with low scrub vegetation, varying from dense to open communities, depending on soil composition and exposure. Floral composition is Mediterranean, characterized by holly oak (*Quercus ilex*), kermes oak (*Quercus coccifera*), pistachio tree (*Pistacia* sp.), cistus (*Cistus* sp.), prickly juniper (*Juniperus oxycedrus*), amelanchier (*Amelanchier vulgaris*), mock privet (*Phillyrea* sp.), sarsaparilla (*Smilax aspera*), etc. The woodland communities are chiefly holly oak, which is replaced, on deeper soils, by pubescent oak (*Quercus pubescens*). Often such stands are mixed with pines (*Pinus halepensis* or *Pinus pinea*).

Weather is typically Mediterranean, hot in summer, cool in winter and wet in autumn and spring. Changes in weather are marked, showing coefficients of seasonal variation of over 60% (Central weather forecasting office).

3. Material and methods

Samples for food habits analysis came from animals actively feeding in an homogeneous environment. They consisted of 82 stomachs collected during the hunting season (September

through December, 1990 and 1991). To complete the annual cycle (January through August, in 1990 and 1991), we also collected 138 feces around feeding troughs.
Samples were analyzed employing the classical method of washing and sieving. During a first experiment (Chambrillon, 1991) we defined the mesh-sizes (5 mm, 2 mm and 1 mm) of the sieves used to sort food particles, and, for each sample, the minimum fraction that should be analyzed (for stomachs 20% of fresh weight, for feces 30%).
Results are expressed in percent dry weight and in frequency of occurrence in samples.
To solve the problem of the very rapid or complete digestibility of certain invertebrates, we used two other sieves to collect their undigestible fractions: i) one 0.8 mm mesh sieve to retain the mouth pieces of snails; ii) one 40 µm mesh sieve to retain earthworm setae.
The number of individual invertebrates was assessed by counts of these fractions, knowing that there are:
- one mouth piece per snail;
- 1,382 setae per earthworm (mean calculated for 1,000 earthworms collected in the study area).
The analyses of part of Wild boar stomachs (n = 23) and feces (n = 13) collected during the same period gave comparable results. Therefore we pooled the results from both analyses.

4. Results

4.1. General composition of the Wild boar diet

The 40 identified food items were grouped into 8 categories (Tab. 1). These data show that the Wild boar is omnivorous, but it has a definite frugivorous tendency.
Natural fruits constitute 57% of the annual diet. Most of the fruits are holly oak acorns, which can be found in 90% of the samples. The lower occurrence of other fruits indicates that the Wild boar consumption pattern is rather opportunistic.
Although vegetal foods are a dominant dietary component and they are present in 100% of the cases, the proportion of animal food should not be neglected. In fact, its part is underestimated, because it is very rapidly or entirely digested. The intake of artificial food (*Zea mays*) is important since it accounts for 1/3 of the annual diet.[1]

[1]Please note that during the two years of study wild boars were fed artificially to capture them (Maillard & Fournier, this volume)

4.2. Monthly changes in the diet

Figure 2 shows the monthly changes in diet from January 1990 to December 1991. Both seasonal and year-to-year variability are evident.
In 1990, acorns were the dominant food item from January to March, as well as later in the year, from October to December. The intake of bait maize was low during the winter months, and more or less constant in the other months. Beginning in June, the diet was much more diversified and several food items became important including mushrooms, animal food and fleshy fruits. Grapes (*Vitis vinifera*) appeared in August. During the summer months, acorns were absent. Only in October they again became important, at the expense of other items.
In 1991, acorns were the dominant food item from the beginning of the year until August. Although in early summer the rest of the diet was much less varied than in 1990, diversity

Table 1: Percentage of dry weight and frequency of occurrence of Wild boar foods.

Category of food (% dry weight)	Plant food (96)						Animal food	Litter
	Natural plant species (64)					Artificially fed maize		
	Fruits (57)			Leaves, steams roots	Mush-rooms			
	Acorns	Other fruits	Grapes					
% dry weight	47	5	5	5	2	32	3	1
% occurrence	90	61	18	96	60	82	88	95

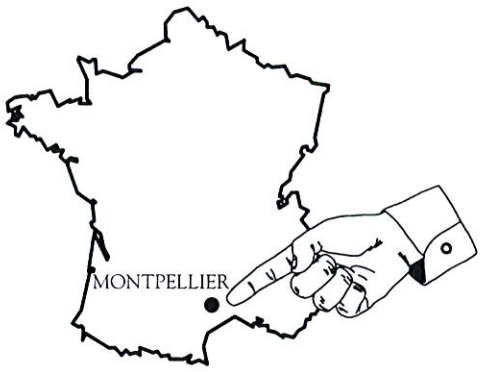

Figure 1 - Study area.

increased in August. Grapes were eaten later and in bigger quantities than in 1990 (t significant for P = 0.05). They constituted 1/3 of the diet in September and October. In comparison, acorns only reappeared in big quantities in November, to the detriment of the other available foods.
Figures 3 and 4 show the seasonal shifts in the consumption of earthworms and snails. Earthworms were absent in summer and although their frequency of intake was high in winter, the quantity intake was more important in autumn. Snails were absent in winter and were mainly consumed in autumn.

5. Discussion and conclusion

There is a direct link between the monthly changes in food resources used by Wild boar and their availability (Tab. 2).
Thus, in the Mediterranean environment, the importance of mast production by holly oak makes it the wild boars' staple food (47% of dry weight over the year for 90% occurrence). They will consume acorns as soon as and as long as available. Many authors stress the fact that the abundance of forest fruits induces an almost monophagic feeding behaviour in the animals (Briedermann, 1965; Palata *et al.*, *op. cit.*; Sjarmidi, *op. cit.*). Conversely, a mast failure forces Wild boar to diversify its diet according to the other food resources available. This is confirmed by the fact that the total number of items ingested per month varies inversely with the quantity of acorns consumed.
A study of the changes in acorn availibility shows that it is linked to the initial quantity of the acorn crop in fall and to the duration of their conservation. A quantitative inventory of the acorn mast production in the study area showed a year to year variability, which may explain the observed differences in diet composition (Fig. 2):
- in 1989, the poor oak mast crop resulted in an acorn shortage as early as June, which was mostly compensated by the many fleshy fruits available in summer (*Amelanchier vulgaris*, *Rubus* sp., *Pistacia terebinthus*, *Prunus* sp, *Smilax aspera*);
- the abundant mast production in 1990 shifted the shortage forward to September 1991. Mast shortage lasted into October 1991, because of the small 1991 acorn crop. Grapes, abundant in early autumn, then constituted the complementary food item.
Jullien *et al.* (1990), Wlazelko and Labudzki (1992) also showed that when the woods bear no fruit, Wild boar will heavily exploit the cultivated areas. In the Mediterranean environment, it appears that successive oak mast crops cannot cover the animals' requirements over 12 successive months.
Maize is an important component of the diet, except when acorns are abundant (December-March). Then maize becomes a secondary food, because mast is the preferred food in all seasons (Vassant, in press).
Animal food, consumed throughout the year (88% occurrence), is probably an indispensable food item. Also, as shown by a correspondence analysis, the intake of earthworms and snails (by number of individuals) is strongly linked to the amount of rainfall, a necessary condition for their accessibility.
These data illustrate the marked frugivorous tendency of the Wild boar in the Mediterranean garrigue. Forest fruit productions have a major influence on feeding activity. When the availability of natural food resources becomes uncertain, opportunistic feeding behaviour incites the Wild boar to exploit vineyards.

6. Acknowledgements

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Table 2: Summary table of the main food items available to Wild boar (Fournier-Chambrillon *et al.*, in press).

	J	F	M	A	M	J	J	A	S	O	N	D
Acorns	■	■	■	■	▒	▒	▒	▒		▒	■	■
Vineyard grapes							▒	■	■	■	▒	
Wild fruits						▒	■	■	■	▒		
Mushrooms	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒	▒
Earthworms	■	■	■	▒	▒				▒	▒	■	■
Snails			▒	▒	▒	▒	▒	▒	▒	▒	▒	

■ Constant availability ▒ Random availability

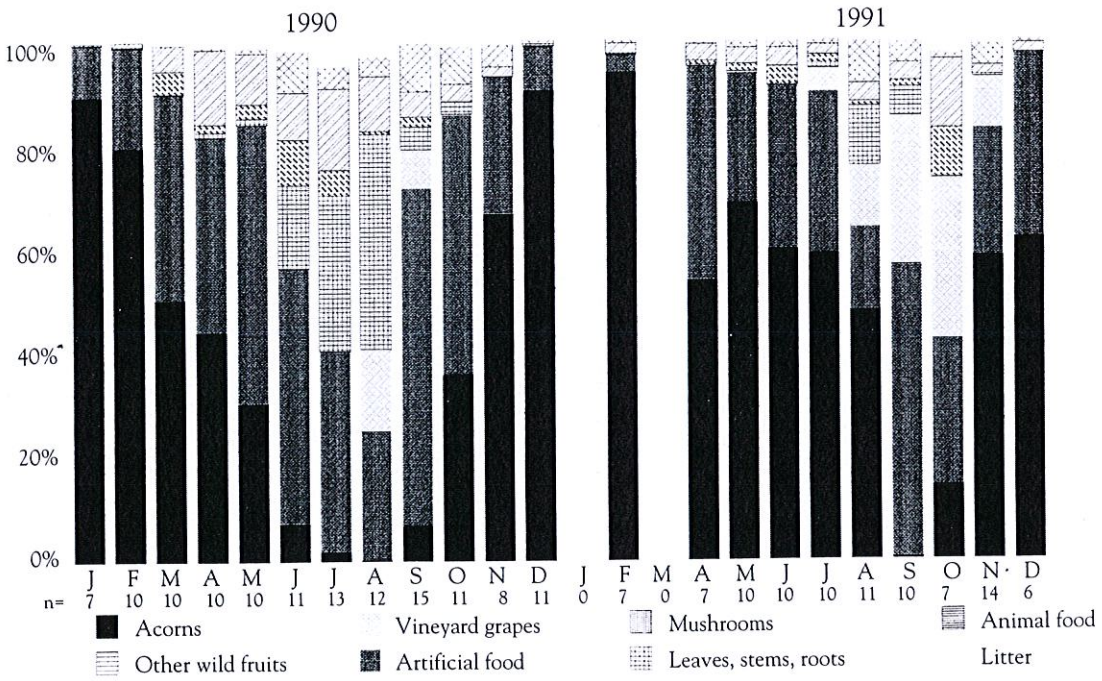

Figure 2 - Monthly changes in the Wild boar diet.

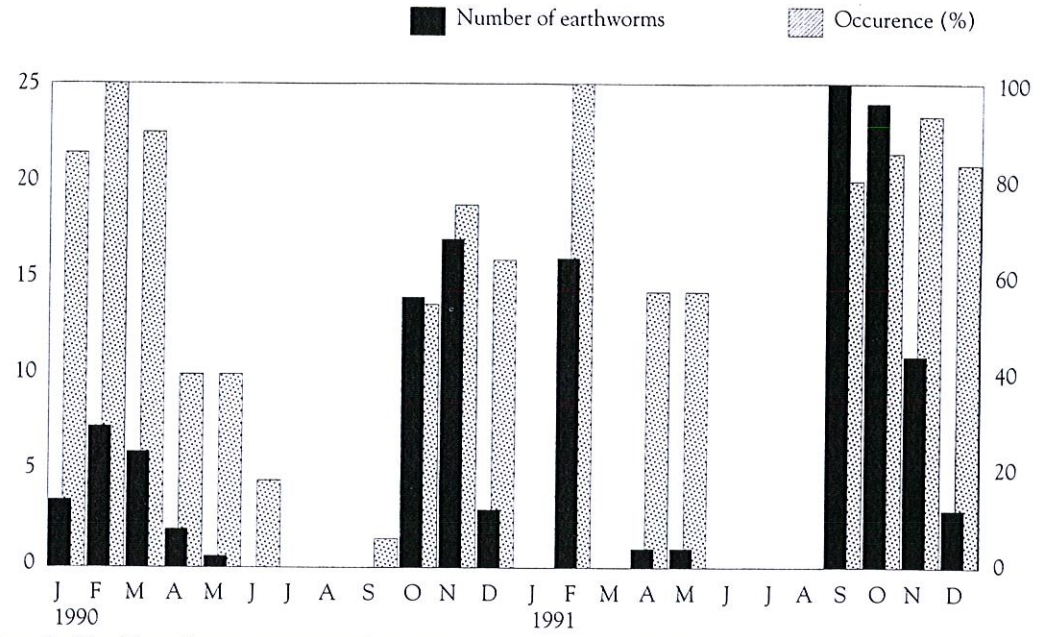

Figure 3 - Monthly earthworm consumption by Wild boar. Occurence = % of wild boar's stomachs containing earthworms.

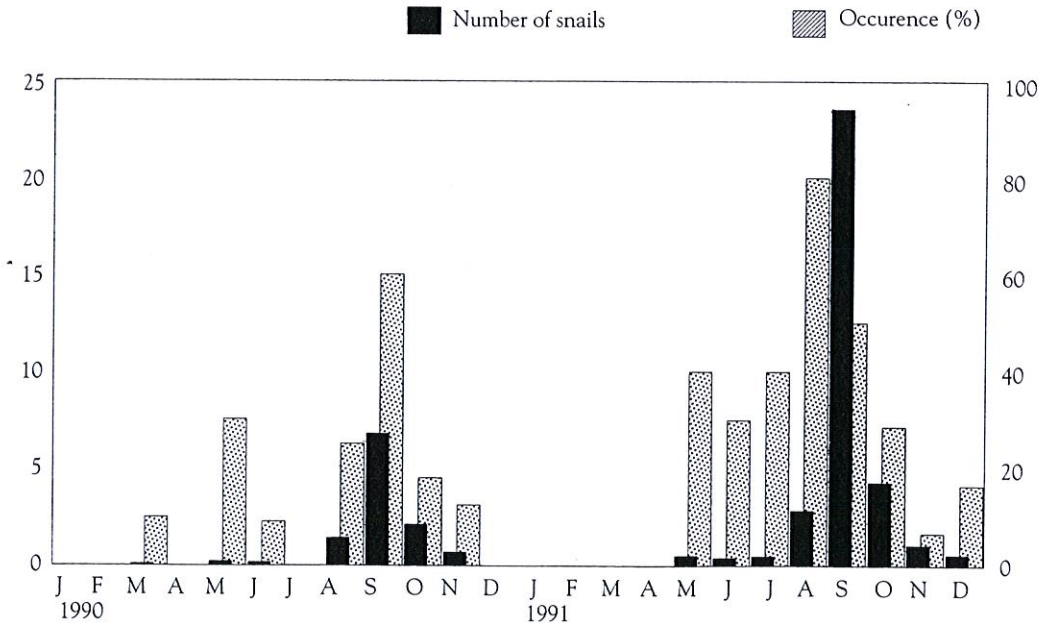

Figure 4 - Monthly snail consumption by Wild boar. Occurence = % of wild boar's stomachs containing snails.

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