

# THE STATUS OF THE EURASIAN WILD BOAR IN PAKISTAN

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**Abstract:** We studied the biology and behavior of wild boar (*Sus scrofa*) in central Punjab, Pakistan. Wild boar was an important vertebrate pest in Pakistan agriculture, but there was little knowledge of methods to manage boar populations. Wild boar ( $n = 519$ ) were collected by shooting from croplands in central Punjab, Pakistan. Age of animals was determined by tooth eruption. Reproduction was studied by observations during necropsy and from tissues removed and examined later. Stomach contents were sampled and the major food items identified. We conducted field trials of several anticoagulants, baits, and bait delivery systems as a means of population reduction. The Eurasian wild boar in Pakistan is smaller than its European and Russian counterparts, but larger than feral hogs in the United States. Breeding commenced in early winter, with most females pregnant by late February. The peak of births occurred in April, May, and June, coinciding with the maturation and harvest of wheat. Wild boar males were sexually mature by 5 to 7 months and females by 4 to 6 months. About half of the animals collected were < 12 months old.

Wild boar fed mainly on plant materials; wheat, sugarcane, rice, maize, and mesquite were major components in their diet. Anticoagulant baits killed a high proportion of wild boar, but baits placed on the ground in fields also killed jackals and porcupines. Exposure of baits to these nontarget species could be avoided by placing bite-sized baits (15 to 20 g) into furrows lightly covered with soil.

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## Introduction

Pakistan is part of the south Asian ancestral homeland of the Eurasian wild boar (*Sus scrofa* L.). Wild boar are distributed throughout lowland Pakistan along the Indus plains and along the rivers emptying into the Indus from the east (Roberts 1977). They occur west of the Indus River around Peshawar, Mardan, Bannu, and Dera Ismail Khan. The spread of irrigation in Pakistan has increased wild boar populations and within the past 50 years they have become a serious agricultural pest.

The USDA/APHIS/ADC/Denver Wildlife Research Center initiated a vertebrate pest research project in Pakistan in November 1985, with funding from the U.S. Agency for International Development (USAID) under the program "Food Security Management." This project was based at the National Agricultural Research Centre at Islamabad, primarily involved with rodent damage problems and secondarily with other vertebrate pests. Our knowledge and understanding of the biology and behavior of wild boar in early 1986 was rudimentary at best. Lacking enough staff members for field collecting, we contracted with an investigator at the University of Agriculture, Faisalabad, to collect wild boar by shooting and to assist in gathering morphometric and reproductive data and other biological information over a period of several years. Much of the information reported here was derived from those collections.

## Methods and Results

### Agricultural Importance

We surveyed damage by the Eurasian wild boar to sugarcane, wheat, and maize in Faisalabad District and to groundnut in Rawalpindi, Attock, and Chakwal Districts in northern Punjab, Pakistan. In these areas, wild boar were the most important vertebrate pest in sugarcane, wheat, and maize, causing more damage than rats, porcupines, or rose-ringed parakeets. They were lesser pests in groundnut. The estimated damage to sugarcane was 11.3%; maize, 6.7%; wheat, 3.0%; and groundnut, 0.9% (Table 1) with combined yield losses in sugarcane, wheat, and maize estimated at U.S. \$7.6 million. The loss of groundnut equaled about \$300,000 annually. Farmers spend up to 2 months guarding sugarcane and maize fields from wild boar attack. The only effective control methods currently used in Pakistan are killing wild boar with highly toxic poisons, such as aldicarb, and shooting them with shotguns. To minimize sugarcane damage, farmers changed from growing soft-rind varieties with high sugar content to hard-rind varieties and lower sugar content. Besides feeding on sugarcane, wild boar utilize the fields for shelter and nesting areas during the growing season, from September until the end of harvest in March. Because of this, varietal changes in sugarcane probably have little effect on reducing boar damage.

### Morphometrics and Age Structure

Five hundred and nineteen wild boar were collected from March 1987 to July 1990 in crop and noncrop areas of central Punjab, Pakistan. The male:female sex ratio (46:54) did not differ significantly from equality. Animals were aged by tooth eruption. We used Matschke's method (1967), as modified by Diong (1973) to determine age of animals <24 months. Using Barrett's (1978) method of 3rd molar eruption and cusp wear, we were able to classify animals >2 years old into age groups from 3 to 6 years or older. Head and body length (HBL) was determined by measuring from the snout to the base of the tail. Shoulder height was measured from the proximal end of the shoulder joint to the distal end of the longest hoof with the forelimb positioned in a straight line. Head length was the distal-most dorsal point of the snout to the base of the skull as palpated with the finger. Body measurements for 360 animals are given in

Table 1. Damage by wild boar to field crops in some districts of Pakistan. (Data extracted from Brooks et al. 1989).

Crop type	No. fields examined	No. fields with damage	% Crop damage
Sugarcane	81	49	11.3
Maize	87	44	6.7
Wheat	103	31	3.0
Groundnut	164	32	0.9

Table 2. We found that animals aged < 12 months represented 48% of the animals collected, those 12 to 24 months, 29%; and animals > 24 months, 23%.

Males grew to a heavier body weight than females and to a larger head and body length (Fig. 1). Wild boar collected from central Pakistan were smaller than their counterparts from the USSR (Kozlo 1968, Gunchak 1978) but larger than feral hogs from South Carolina or Tennessee (Brisbin et al. 1977, Henry 1970). They were also larger than those reported by Smiet et al. (1979) from southern Pakistan. The heaviest male weighed 135 kg and the longest male measured 163 cm HBL and stood 92 cm tall at the shoulder. The heaviest female weighed 85 kg and the longest female measured 143 cm HBL.

### Reproductive Biology

Animals were necropsied in the field to determine visible pregnancy in females and to remove reproductive tissues from both females and males for later examination. We used the presence of visible tubules in the cauda epididymis and the presence of corpora lutea in the ovaries to determine sexual maturity in males and females, respectively. Males were sexually mature between the ages of 5 and 7 months and females between 4 and 6 months. The testes weights of males changed seasonally, as did the ovarian weights in females, with peak weights seen in January-March in males and April-June in females. Pregnancies were recorded primarily between February and May; a few were seen in August and September. Almost 32% of all sexually mature females were visibly pregnant during the 3 years of the study. The peak of births occurred in the months of April, May, and June (Fig. 2). Overall, litter sizes averaged  $5.6 \pm 2.2$  (SD). However, the number of young per litter in females < 12 months ( $4.9 \pm 2.0$ )

Table 2. Mean body weights and measurements, classified by age, of wild boar from Pakistan (Mean  $\pm$  SD).

Sex/age class (mo)	No. animals examined	Body wt (kg)	Head and body length (cm)	Shoulder height (cm)	Head length (cm)
<u>Females:</u>					
1 = 1-2	10	3.8 $\pm$ 2.1	49.2 $\pm$ 9.8	26.8 $\pm$ 5.2	15.1 $\pm$ 3.0
2 = 3-4	24	13.2 $\pm$ 4.8	74.8 $\pm$ 8.2	40.1 $\pm$ 5.6	22.6 $\pm$ 2.9
3 = 5-6	28	26.3 $\pm$ 5.8	95.8 $\pm$ 8.4	52.1 $\pm$ 4.1	28.6 $\pm$ 2.5
4 = 7-12	48	33.1 $\pm$ 7.9	104.1 $\pm$ 7.0	57.0 $\pm$ 4.8	30.6 $\pm$ 2.5
5 = 13-18	26	41.3 $\pm$ 8.9	111.1 $\pm$ 5.9	60.1 $\pm$ 3.6	33.1 $\pm$ 2.2
6 = 19-24	21	51.1 $\pm$ 10.4	120.5 $\pm$ 5.7	64.9 $\pm$ 4.3	35.5 $\pm$ 1.9
7 = 25-36	29	58.8 $\pm$ 9.5	126.8 $\pm$ 5.7	67.2 $\pm$ 3.9	37.3 $\pm$ 2.2
8 = >36	17	66.5 $\pm$ 12.0	131.2 $\pm$ 7.6	69.6 $\pm$ 3.7	40.7 $\pm$ 3.0
<u>Males:</u>					
1 = 1-2	11	5.4 $\pm$ 3.8	48.9 $\pm$ 12.4	26.5 $\pm$ 6.7	14.8 $\pm$ 3.1
2 = 3-4	12	14.5 $\pm$ 3.1	77.3 $\pm$ 5.1	42.6 $\pm$ 3.5	22.8 $\pm$ 1.5
3 = 5-6	27	33.4 $\pm$ 8.8	105.0 $\pm$ 7.8	55.7 $\pm$ 6.5	30.2 $\pm$ 2.1
4 = 7-12	30	38.0 $\pm$ 7.9	111.0 $\pm$ 7.7	61.3 $\pm$ 4.2	32.6 $\pm$ 3.2
5 = 13-18	18	48.3 $\pm$ 8.7	117.1 $\pm$ 7.2	65.4 $\pm$ 4.0	35.3 $\pm$ 2.2
6 = 19-24	17	66.3 $\pm$ 13.1	129.6 $\pm$ 7.1	73.1 $\pm$ 6.1	38.3 $\pm$ 2.4
7 = 25-36	27	84.4 $\pm$ 16.2	139.7 $\pm$ 9.0	77.9 $\pm$ 7.1	41.9 $\pm$ 3.2
8 = >36	15	105.6 $\pm$ 9.9	148.7 $\pm$ 5.9	84.4 $\pm$ 3.9	44.3 $\pm$ 3.3

was less than, but not statistically different from, the number of females > 12 months ( $5.9 \pm 2.2$ ). Annual production per female of the population < 24 months averaged only 1.3 young (16% of animals were pregnant), while females > 24 months (43% were pregnant) averaged about 3 young.

### Food Habits

We examined the stomach contents of 393 wild boar. Plant materials, both cultivated and noncultivated, comprised 96.9% of the total mass; animal matter (2.5%) and mud (0.6%) made up the rest (Table 3). Wheat, both leaves and grains, was the main dietary item, comprising 54.7% of the mass and occurring in 262 stomachs. Sugarcane (8.6% and found in 64 stomachs), rice (3.6%, 20 stomachs), and mesquite (*Prosopis juliflora*, 7.2%, 43 stomachs) were the other predominant items. Wheat was eaten as leaves in December through March; then wheat grains became the major item. This trend continued through July (Fig. 3). Rice appeared in August, peaked in October, and was harvested by December. Sugarcane was important in December through March. Mesquite was heavily utilized in June and July, following wheat harvest. Several grasses and weeds appeared predominantly in the diet from August through November.

### Control Trials

We used the anticoagulants, warfarin (0.025%) and coumatetralyl (0.025%), in field trials to affect population reduction. Both materials effectively killed animals and completely reduced wild boar activity in fields in 15 to 28 days. This approach, however, required large amounts of bait. Exposing baits on the ground surface killed jackals (*Canis aureus*) and crested porcupines (*Hystrix indica*) that consumed them. We considered several bait delivery systems to eliminate exposure of baits to these nontarget species and tested the use of modified wooden hog feeders as bait stations and placement of bite-sized baits into furrows lightly covered with soil. The hog feeders were poorly used in several trials, even after 4 weeks' exposure. Furrow baiting was more effective at preventing exposure of jackals and porcupines from finding the baits and produced good bait take by wild boar. This aspect of our research was not completed during our time in Pakistan.

### Discussion

The wild boar is a serious pest of field crops in Pakistan. In early 1986 very little was known of its biology and behavior in the irrigated croplands of central Punjab, Pakistan. Since then, through the intensive study of over 500 animals collected primarily by shooting, we obtained a better understanding of the ecology of this species in the central Punjab. The wild boar of Pakistan is smaller than its counterparts in the former USSR, but slightly larger than feral hogs in the United States.

Wild boar in Pakistan breed on a schedule similar to that in Spain and France, with the

Table 3. The most common dietary items found in the stomach contents of wild boar collected from Faisalabad and adjacent districts, Pakistan.

Food item	Percent of mass	Frequency of occurrence
Wheat ( <u>Triticum aestivum</u> )	54.7	262
Sugarcane ( <u>Saccharum officinarum</u> )	8.6	64
Rice ( <u>Oryza sativa</u> )	3.6	20
Mesquite ( <u>Prosopis juliflora</u> )	7.2	43
Maize ( <u>Zea mays</u> )	1.6	8
Vegetables	1.0	8
Shishum ( <u>Dalbergia sissoo</u> )	1.0	8
Sour plum ( <u>Cordia mixa</u> )	1.1	6
Acacia ( <u>Acacia arabica</u> )	0.9	10
<u>Sorghum halapense</u>	1.1	6
<u>Cyperus rotundus</u>	1.8	15
<u>Echinochloa</u> spp.	1.6	8
Unidentified grasses	2.9	20
Unidentified weeds	1.6	16
Animal tissue	2.5	17

majority of births in the spring and a few births in the late summer. The breeding season coincides with the cultivation and maturation of wheat in the central Punjab. The average litter size over 3 breeding seasons was 5.6/female, averaging less in younger females (4.9 < 12 months) and more in older females (5.9 > 12 months). This mean litter size is greater than reported by some studies in Spain, France, and Germany (Saez-Royuela and Telleria 1987, Aumaitre et al. 1984, Mauget 1972, Briedermann 1971), but approximates that observed in other studies from Germany, Austria, and France (Stubbe and Stubbe 1977, Martys 1982, and Mauget 1982). Females can breed at 4 to 6 months, more closely resembling the pattern in domestic sows than that reported for feral hogs. Males were sexually mature in 5 to 7 months.

The diet of wild boar consisted mainly of wheat, sugarcane, rice, maize, mesquite, grasses and weeds. These dietary items overlapped during the year, with wheat the dominant element from December to June, sugarcane from December to March, mesquite from June to August and again in October and November, while rice was prominent in August until November.

Wild boar are well-adapted to the semiarid, irrigated plains of the Indus valley and the river plains in the eastern Punjab. The intermixture of the several crops and noncrop habitats, especially wheat, sugarcane, and mesquite, provides an abundance of very good shelter during the breeding season. Nutritious food during pregnancy and lactation are provided by the wheat crop. Nowhere do the animals have to travel more than a kilometer or so to find suitable shelter and food. The only harassment they receive is from man, dogs, and jackals, since the wolves and the tigers are now absent from this part of the subcontinent. Water is present in abundance in irrigation distribution canals, drainages, rivers, and in the flooded fields themselves.

Management of wild boar populations under these conditions is difficult. Farmers have little means to protect their fields from wild boar attack; the animals are large enough to injure or kill a threatening human. Even with dogs present, boar will occasionally attack farmers. Population reduction using lethal means of control, such as shooting or cursory poisoning, is generally ineffective since it removes only a few animals from a small area. Shooting is also expensive for farmers. During the collection of 519 animals over 3 1/2 years, an average of 4 shots were fired for every animal obtained by experienced hunters. If population reduction were attempted on a large scale using available methods, it would require a large amount of hunters and ammunition or poison, bait, and labor. Only a governmental agency with committed resources could attempt this.

Fencing is not practical under Pakistan conditions, since much of the land utilized by wild boar is in private holdings and in small plots. Likewise, fencing is too expensive for small-holding farmers to consider. Wild boar meat has no value for the Muslim population of Pakistan; however, wild boar are hunted for sport or to reduce crop damage. Hunting is generally uncoordinated and unregulated.

Habitat elimination or manipulation is also not practical. Sugarcane fields provide excellent cover during the months from September to March. Thickets of acacia and mesquite abound in nonagricultural areas and provide sanctuary for animals in the summer months. Mesquite now grows wild in the Indus plains and is not likely to be reduced in area.

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