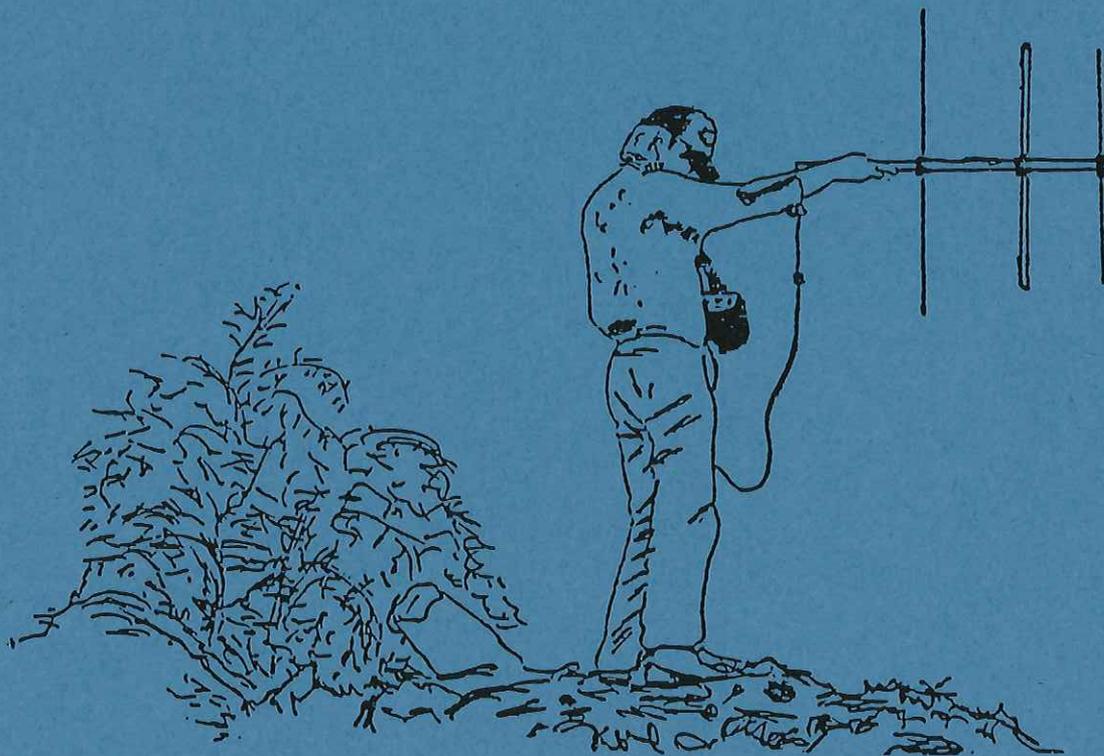


VERTEBRATE PEST
CONTROL PROJECT

FOOD SECURITY MANAGEMENT
POST-HARVEST MANAGEMENT
COMPONENT

*MOVEMENTS OF WILD BOAR
AS DETERMINED BY
RADIO-TELEMETRY AND VISUAL SIGHTING*

*Technical Report No. 28
June 1991*



GOP/USAID/DWRC
National Agricultural Research Centre
Islamabad, Pakistan

MOVEMENTS OF WILD BOAR AS DETERMINED BY
RADIO-TELEMETRY AND VISUAL SIGHTING

By

M. Munir Asif, M. Hafiz Khan, Ejaz Ahmad, Joe E. Brooks
and Richard Johnson

A Govt. of Pakistan/USAID Project
Vertebrate Pest Control Project
Denver Wildlife Research Center
Animal and Plant Health Inspection Service
Science and Technology
U. S. Department of Agriculture

and

University of Agriculture,
Faisalabad

Technical Report No. 28
(Unpublished)

June 1991

MOVEMENTS OF WILD BOAR AS DETERMINED BY RADIO-TELEMETRY AND VISUAL SIGHTING

by M. Munir Asif¹, M. Hafiz Khan², Ejaz Ahmad¹
Joe E. Brooks³ and Richard Johnson⁴

Abstract: Five wild boar (*Sus scrofa*) were captured, fitted with radio-collars and released into croplands and marshy areas in Faisalabad District. Movements were monitored for 7 months. In Fateh Jhang, one young male wild boar had a radio transmitter surgically implanted into his abdominal cavity and released 2 days later. His signal was followed for 6 months after release. Two other wild boar, one male and one female, were instrumented with regular radio transmitters attached to neck and girth collars. These animals were followed until death of the male and loss of the radio by the female. Maps are presented showing the radio locations and visual sightings of the tagged animals.

INTRODUCTION

The Eurasian wild boar (*Sus scrofa*) is a native of Pakistan (Roberts 1977) and widely distributed throughout most of the lower-elevation parts of the country. It is a particular pest of wheat (Ahmad et al. 1991) and sugarcane (Shafi and Khokhar 1986) and is regarded as the second most important vertebrate pest of agriculture in Pakistan (Brooks et al. 1989).

One of the things needed for effective management of wild boar populations is information about their range of movements, both on a daily or nightly basis and in regard to seasonal changes in movements. This helps in understanding social behavior, group size, foraging range, and a number of other items needed by the vertebrate pest control specialist.

Radio-telemetric determinations of home range, movements, and habitat use of feral pigs, feral hogs, and European wild boar have been done by Baber and Coblentz (1986), Kurz and Marchinton (1972), Mauget (1980), Singer et al. (1981), and Wood and Brenneman (1980). Aside from the studies by Mauget (1980), none were done in agricultural areas or in dry scrub forests typical of the dry-farming areas of Pakistan. In order to better understand the biology and behavior of wild boar in these habitats, we undertook

-
1. Program Specialist, GOP/USAID/DWRC Vertebrate Pest Control Project, NARC, Islamabad, Pakistan.
 2. Associate Professor, Department of Entomology, University of Agriculture, Faisalabad, Pakistan.
 3. Wildlife Biologist, USDA/APHIS/Denver Wildlife Research Center, Denver, Colorado, USA.
 4. Senior Electronics Technician, USDA/APHIS/Denver Wildlife Research Center, Denver, Colorado, USA.

a study of their movements by means of radio-telemetry. Our objectives in this study were to obtain information on range of nightly and daily movement, seasonal changes in movement patterns in response to crop changes, and habitat preferences.

This is a preliminary report of our basic findings. Such details as the size of the home range, using estimates based upon the minimum-area (convex polygon) method (Mohr 1947), geometric centers of activity (Hayne 1949), and activity radii - the distance between each radio location and the geometric center of activity (Dice and Clark 1953), will be calculated later. Other measures of home range size (harmonic mean method, Dixon and Chapman 1980; 95% ellipse method, Jennrich and Turner 1969; and 95% weighted ellipse, Samuel and Garton 1985) may be calculated for comparisons.

MATERIALS AND METHODS

In Faisalabad, wild boar were captured alive in snares or in portable root-door panel traps (modified from Fraser 1975; and Williamson and Pelton 1971). Two animals were captured in a marshy area, two from sugarcane fields, and one male was taken in a forested area. Captured animals were immobilized with ketamine hydrochloride. They were sexed, weighed, and fitted with radio collars. Radio transmitters put out a signal in the 164 MHz range. The animals were monitored for a period of 7 months, from November 1990 to May 1991.

In Fateh Jhang, 5 wild boar, 3 males and 2 females, had been held in an enclosure since about 1 month of age. At the time of release, they were 19 months old. One male had a radio surgically implanted into his abdominal cavity. The surgery was done under ketamine hydrochloride/xylazine hydrochloride anesthesia, plus injections of diazepam. Following surgery he was given a massive dose of long-acting penicillin. He was ear-tagged with a plastic cattle tag. Two days later he was recaptured in the enclosure and his incision was examined and found to be healing well so he was released. His radio transmitted in the 167 MHz range. An untagged female escaped from the enclosure by jumping the wall the same day he was released. She joined the male and they were seen together for the next 2 weeks. Two other animals were radio-collared, ear-tagged, and released at the enclosure, along with a male without radio but ear-tagged. These animals were monitored for 7 months, from late October 1990 to May 1991.

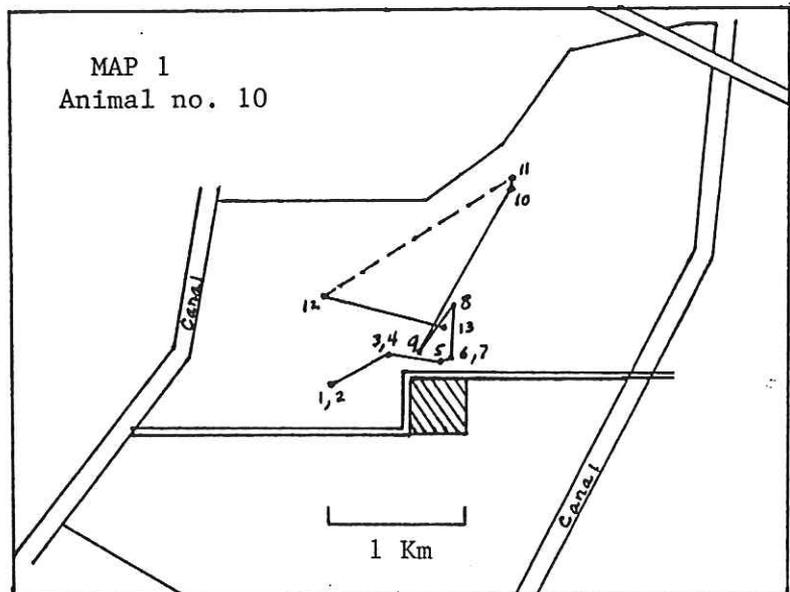
The habitat at Fateh Jhang was mainly a scrub forest dominated by trees and shrubs: *Acacia modesta*, *Geranium wallichianum*, *Populus nigra*, *Olea cuspidata*, *Dalbergia sissoo*, *Adhoda vasica*, *Dodonia viscosa*, *Acacia niloticus*, and grasses: *Cynodon dactylon*, *Dicanthium annulatum*, and *Desmostachya bipinnata*. Crop fields are intermixed but small, consisting of wheat, sorghum, millet, maize and other fodder crops in season.

RESULTS

Our findings are presented on the accompanying maps for the 8 animals that were instrumented. Some of the observations were sightings. All locations are indicated with solid circles. Forced movements (i. e. chasing by dogs or hunters, habitat burned) are shown as dashed lines. Movement locations are given sequentially.

Animal No. 10.

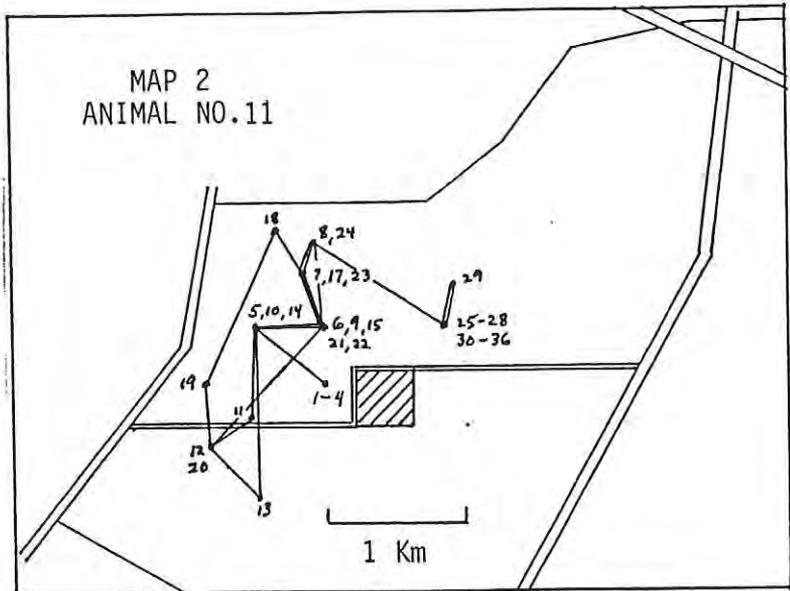
This 15 kg female was released on 15 January 1991 into the field of sugarcane where she was captured. She was still there on 16 January. On the 18th and 19th she was located 300 m away in another field of sugarcane. Again on the 22nd she was still in the 13 acre sugarcane field. On the 25th she was located in the sugarcane field but moved 300 m north into a guava orchard that evening. On the 28th she was again back in the same sugarcane field. On 2 through 6 February she was found in a wheat field about 1 km northeast. On 6 February, at 2000 hr in the evening she moved southeast into a wheat field. On 10 February she was chased by dogs from this area back into the sugarcane field she was located in on 29 January. She was killed by hunters on 14 February but the location was not known. She ranged over an area of about 2 km².



Animal No. 11.

This 15 kg female was captured along with animal no. 10 and was radio-collared and released in the same 8 acre sugarcane field. Her movements differed from her sibling's, however. On 20 January she moved 400 m NW into another sugarcane field. On the evening of 22 January she moved 300 m E to a sugar-cane field where she spent the night. On 25 January at 2000 hr she was back into the field she was located in on 20 January. From there she moved at 2100 hr 600 m SW into a guava orchard. At 2400 hr she had moved another 300 m SE. On 28 January she was in the sugarcane field of 20 January but moved 300 m E into a field of Triton Variety sugarcane at 2000 hr. She was in the original sugarcane field on 2 February

but moved E 300 m into the Triton field. At 2100 hr she was seen with 3 adult and 3 young wild boar in a fallow field 300 m N of the Triton field. From here she was tracked 300 m NW in a potato field at 2200 hr. On 5 February she was in the Triton field, moved at by 2000 hr N about 500 m. On 10 February she was located in a sugarcane field 600 m E of the Triton field. Located here until 14 February at 2200 hr when she moved 300 m N into a



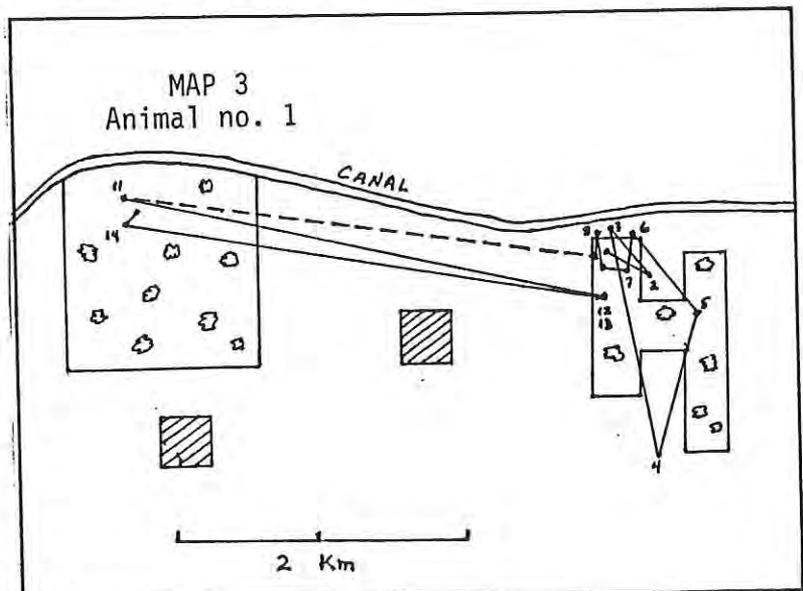
guava orchard. Remained in the sugarcane field and located there on 22 and 28 February. On 5 March she was killed by hunters in the sugarcane field where found on 20 January, about 1 km E of her last location. She ranged over an area about 3 km².

Animal No. 1

This animal, an 86 kg male, was captured in a snare in a forested area adjacent to a canal. He was released on 27 March 1991 and followed until 28 May 1991. His subsequent movements indicate that the forested area was his home. He visited a nearby wheat field (2) on 28 March and remained there until 31 March. On 2 April he was sighted by some farmers and tried to attack their dog (4). He was again sighted on 4, 6, and 13 April. He remained in or near the forest.

He was sighted again on 25 and 28 April. On 9 May he was sighted by some farmers near the edge of the forest (10) and was chased by dogs, crossing 2.5 km of open fields to another forested area to the west (11).

On 19 May he was again sighted back in the original forested area (12). He was seen there on 25 May (13) but by late afternoon his signal was located in



the forested area to the west (14). We tried to approach him but he moved in a circle away from us (15).

Animal No. 427

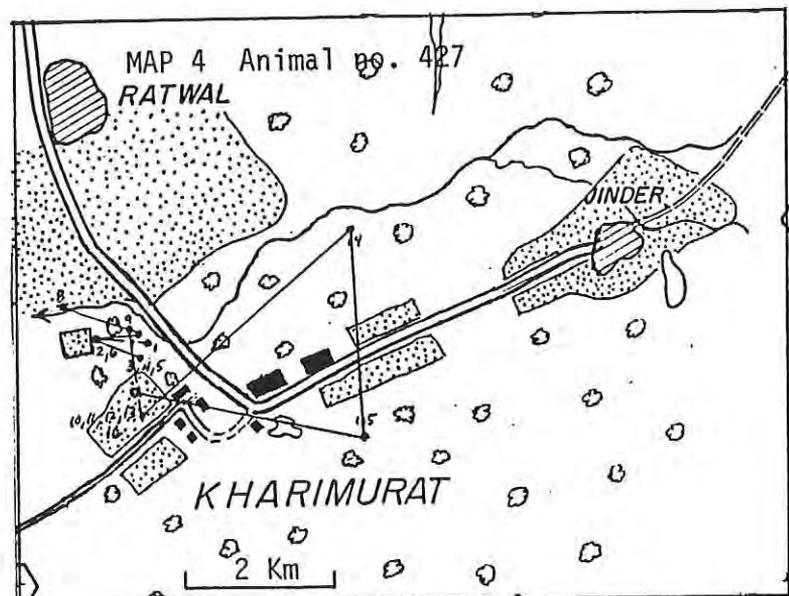
This 32 kg male was interesting, not only because his radio transmitter was implanted into his abdomen, but because the day he was released from the pen, 25 Oct 1990, an untagged female jumped the wall of the pen and joined him in his travels. They were seen together for the next few weeks. In fact, they were joined by female No. 432 and male no. 431, who had no radio. The day after release, the male was seen in a sorghum field 1 km from the release point, along with the untagged female. The two animals were seen in the same area for the next 5 weeks, joined by female no. 432 and male no. 431. His radio signal was lost from after 21 Nov until 13 Feb 1991. The signal that date was received from up on the slopes of the small hills behind Tanaza Dam. This location was 3 km from his release point. Numerous locations at this same point were made over the next 2 months. His signal was last received on 29 Apr 1991, 6 months after his release. He was sighted in a wheat field in back of the livestock pens on 17 May along with female no. 432.

Animal No. 432

This 32 kg female was radio-collared and released on 4 Nov 1990, along with an uncollared male with ear tag no. 437, and a radio-collared 43 kg male with ear tag no. 433. Her transmitter put out a strong signal and she soon joined male no. 427. She managed to drop her radio-collar on 23 Dec 1990, but because it was giving a mortality signal, it was recovered from near Tanaza Dam. This animal was later seen on 25 Feb 1991 and on 17 May 1991 along with male no. 427.

Animal No. 433

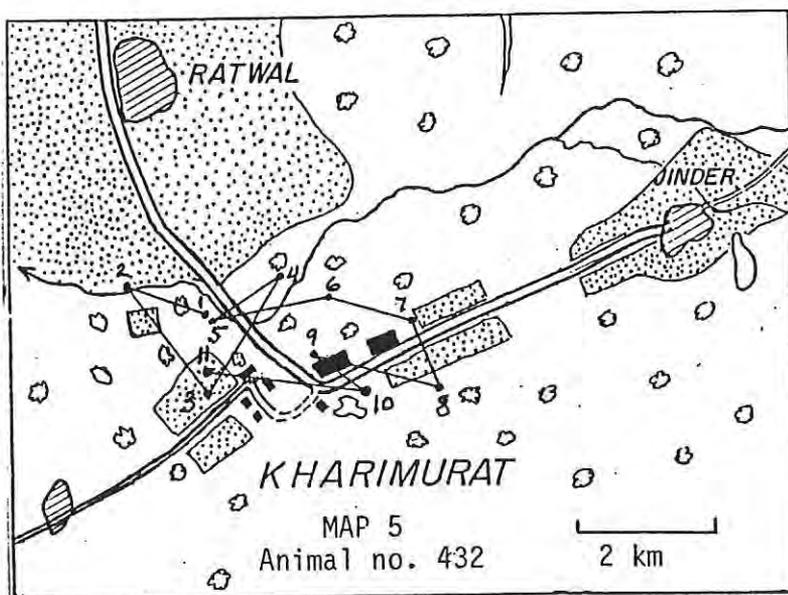
This 43 kg male with ear tag no. 433 was released on 4 Nov 1990, along with the radio-collared female and the uncollared male. He set up a range of movement centered to the east of the release site, keeping to the scrub forest mainly. He was located successfully in this area for 11 weeks. On 30 Jan 1991 a mortality signal was traced to his resting site near the village of



Jinder. He apparently died from eating poison bait placed out by other team members for wild boar control near Jinder.

Animal No. 2

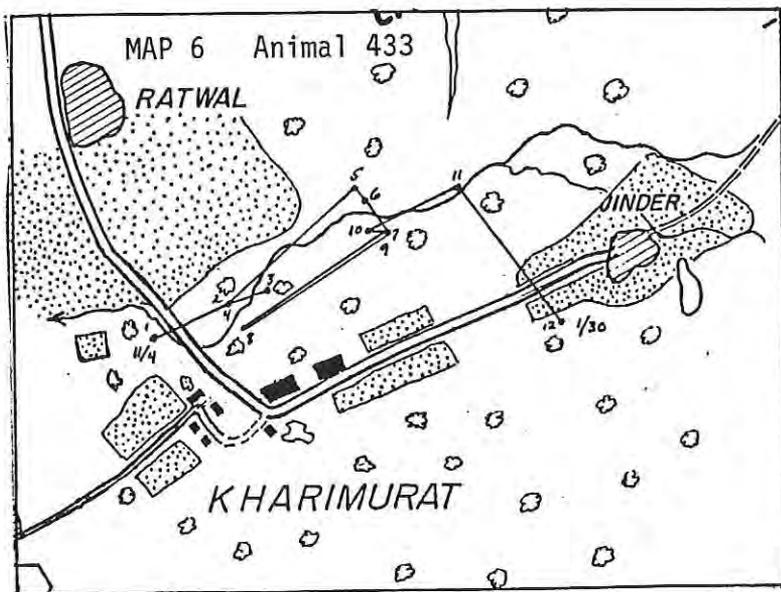
The movements of this 41 kg female were monitored for 4 months and almost 100 observations were obtained. Her movements were the most extensive of all the animals we tracked. She occupied two parts of the marsh that were separated by fallow fields and a few crop fields. Her movements are shown monthly on 4 maps, since they were so extensive.



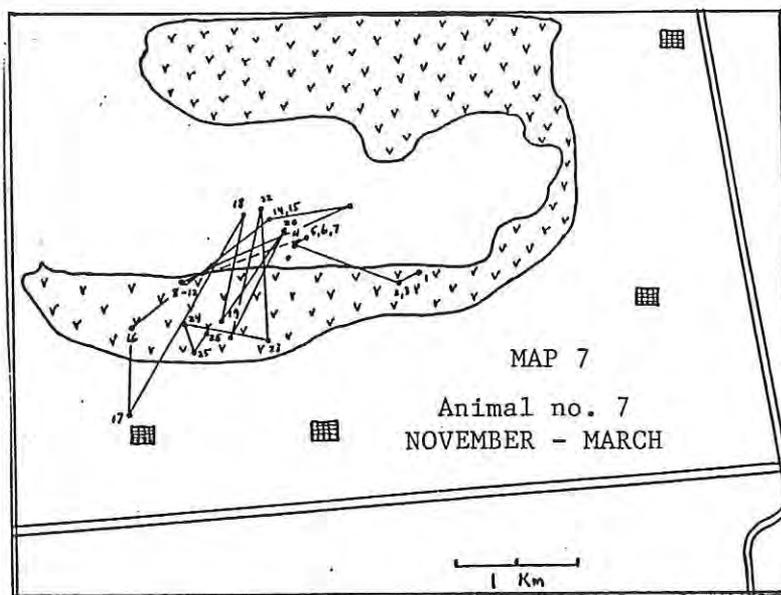
November: She was captured and released on 14 November 1990 into the north arm of the marsh. She moved out of the marsh to visit a sugarcane field (4,8) and a mustard field (12).

December: She was forced to move because of dogs (8,9) and ran into the south arm of the marsh. After visiting a sugarcane field (11), she returned to the north marsh and foraged out into a sugarcane field (15) and then into a potato field (16), crossing a paved road in doing so. She again visited the same sugarcane field (18), but was next located in the south marsh. Here she stayed, foraging into sugarcane (22,30), wheat (31), a fodder crop (27) and into the jungle area along the canal.

January: In early January, she continued to forage out from the south marsh, visiting sugarcane (3,5,6,10), wheat (14,19), and the canal-side area (7,15). Later in the month, she returned to the north marsh, foraging into sugarcane (24).



February/March:
She was found in early February in the north marsh, again visiting sugarcane (4) and mustard (8) and was located that evening in the canal-side area (21) and later visited a field of carrot across the canal (22). She spent the remainder of February and early March in the south marsh. She was killed by hunters in the south marsh on 16 March 1991.



Animal No. 7

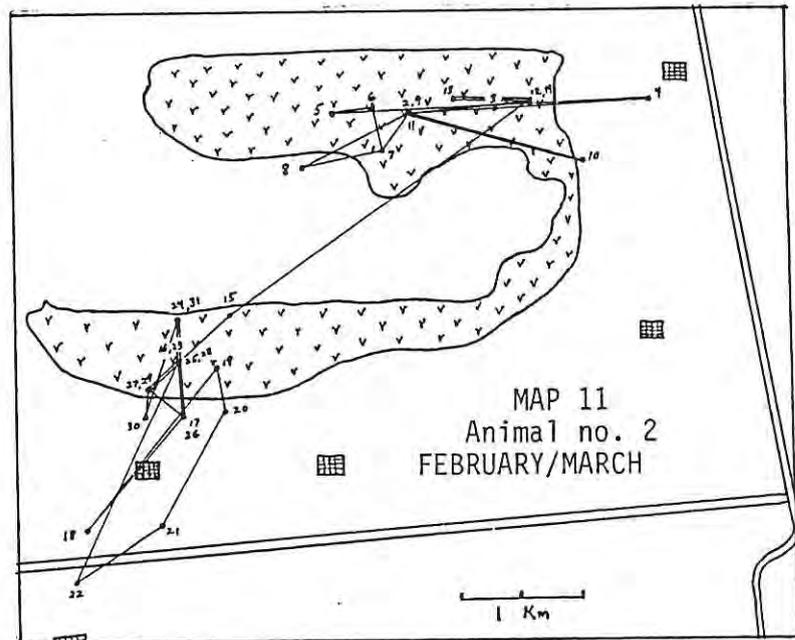
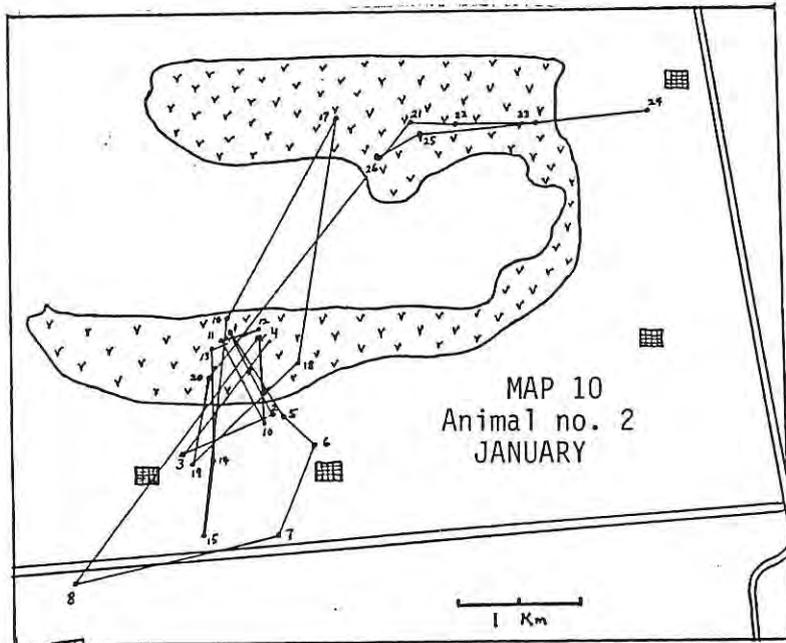
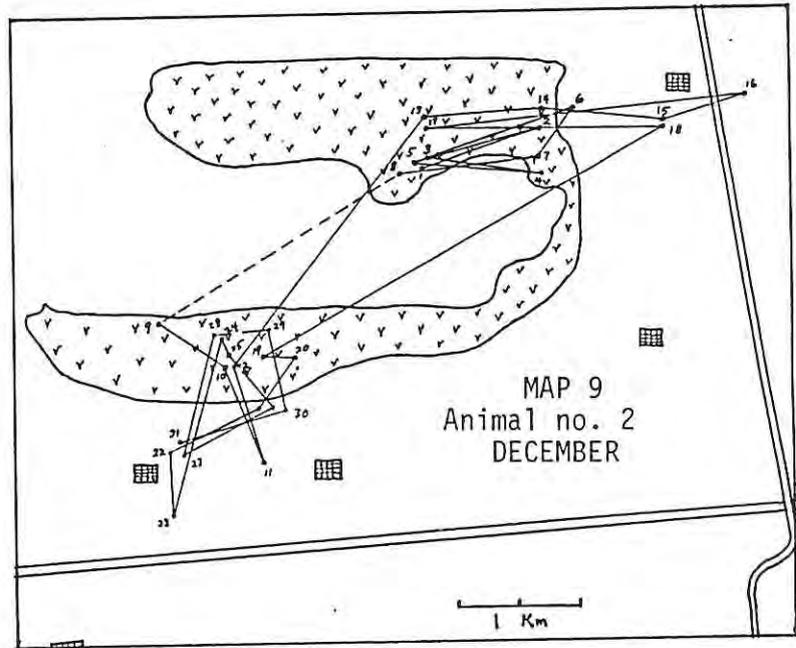
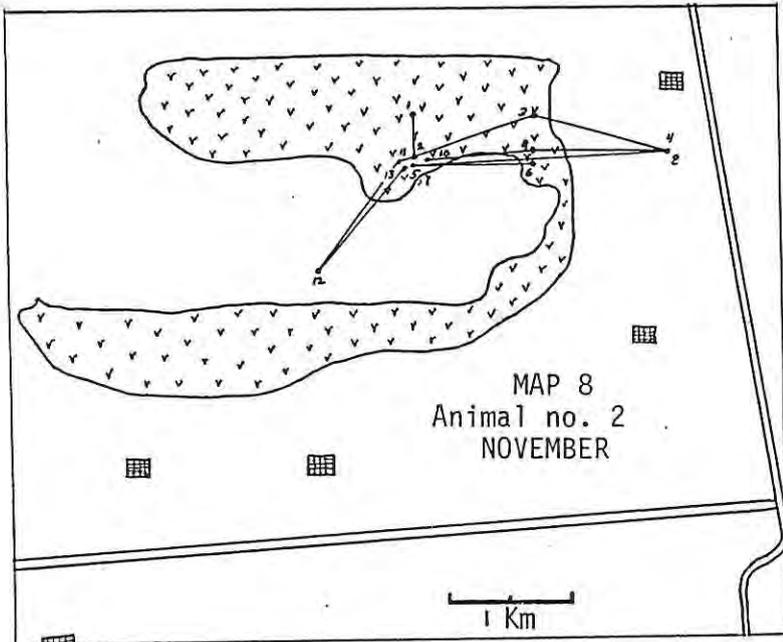
This 46 kg female was followed for 4 months, from 5 November 1990 until 6 March 1991. However, her signal was not located from 29 November until 23 February 1991, when it was picked up from the marsh (24). Only 2 other locations (25,26) were obtained up to 6 March.

DISCUSSION

The findings from the animals radio-tracked near Faisalabad illustrate the hazards faced by wild boar in the heavily human-populated agricultural areas of central Punjab. Humans and dogs killed 3 of the 5 animals radio-tagged during the 7 months of the study. The 2 females radio-tagged in the marsh area were harassed by hunters, dogs, and had their habitat burned not once but three times.

The movements of the two females living in the marshy area are interesting. From the marsh, where they rested during the daytime hours, they foraged outward at night into the surrounding agricultural fields. Some of these nighttime forays covered several kilometers in length and involved visiting several fields in succession.

The wild boar released as adults after 18 months of life in a penned enclosure reverted back to a wild existence very quickly. They located the sorghum fields 1 km distance to the west in one night. They persisted in the area as long as sorghum was in the fields. By late January they were visiting the wheat fields in back of the livestock pens. By the end of January and mid-February they had ventured into the hills to the south of the original release point. These slopes are abundantly covered with scrub forest and there are small seepages scattered in the ravines for



water sources. None of the animals released from the pen ever travelled more than 5.5 km from the release point.

Baber and Coblenz (1986) give a summary of home range size for radio-tracked feral pigs and wild boar by feral pig crosses, as estimated using the minimum convex polygon method. On most of the studies, the home range sizes for males ranged from 1.1 km² to 5.3 km² and for females, from 1.1 km² to 4.4 km². In Baber and Coblenz's study, they found smaller ranges for the female feral pigs, only 0.67 km².

Our findings are in agreement with the home ranges summarized by Baber and Coblenz (1986). The two young animals in the sugarcane area covered only about 1.5 km² (without calculating), while the large male in the forested area generally stayed within a 1 km² area unless disturbed.

The two females in the marshy area had the most extensive ranges. Animal No. 2 ranged up to 6 km from one side of her activity area to the other, while animal No. 7 ranged almost 7 km from one side to the other.

The three radio tagged wild boar, raised in an enclosure for 18 months and then released, used areas of about 3 to 6 km² in extent. Male No. 433 was 5.5 km distance from his release point when he died, the maximum moved by any of the Fateh Jhang animals.

Generally home range size in wild pigs is believed to vary inversely with resource abundance and animal density (Diong, 1982; Singer, 1981; Singer et al. 1981). If this is so, the animals living in irrigated crop lands near Faisalabad have abundant resources at hand. Those living in the marsh area have to travel longer distances to reach all their resources. The wild boar near Fateh Jhang apparently fall somewhere in between, having to search out wheat or sorghum fields in season but hiding in the scrub forest areas during the day.

Acknowledgements

We wish to thank Saleem Masih for his help in the capturing and radio-tracking of wild boar in the Faisalabad area. We also thank Mohammad Salim for his help in visual sightings of wild boar in the Kherimurat area.

This study was supported by funds given by the U. S. Agency for International Development under the project "Food Security Management, Vertebrate Pest Control Project, PASA IPK-0491-P-IF-5017-06." We also thank the Pakistan Agricultural Research Council and the National Agricultural Research Centre, Islamabad, for providing laboratory and office space for the project.

Literature Cited

- Ahmad, E., J. E. Brooks and M. H. Khan. 1991. Preliminary analysis of the diet of wild boar in Pakistan. Technical Report No. 27, Vertebrate Pest Control Project, NARC, Islamabad. 10 pp.
- Baber, D. W. and B. E. Coblentz. 1986. Density, home range, habitat use, and reproduction in feral pigs on Santa Catalina Island. *J. Mammal.*, 67: 512-525.
- Brooks, J. E., E. Ahmad, I. Hussain, and M. H. Khan. 1989. The agricultural importance of the wild boar (*Sus scrofa* L.) in Pakistan. *Trop. Pest Manage.*, 53(3): 128-131.
- Dice, L. R. and P. J. Clark. 1953. The statistical concept of home range as applied to the recapture radius of the deermouse (*Peromyscus*). *Univ. Mich. Lab. Vertebr. Biol. Contrib.* 62. 15 pp.
- Diong, C. H. 1982. Population biology and management of the feral pig (*Sus scrofa* L.) in Kipahula Valley, Maui. Ph.D. dissert., Univ. Hawaii, Honolulu. 408 pp.
- Dixon, K. R. and J. A. Chapman. 1980. Harmonic mean measures of animal activity areas. *Ecology* 61: 1040-1044.
- Fraser, T. K. 1975. A cheap effective portable pig trap. *Queensland Agric. J.* 1975 (May/June):366-369.
- Hayne, D. W. 1949. Calculation of the size of home range. *J. Mammal.*, 30: 1-18.
- Jennrich, R. I. and F. B. Turner. 1969. Measurements of circular home range. *J. Theor. Biol.*, 22: 227-237.
- Kurz, J. C. and R. L. Marchinton. 1972. Radiotelemetry studies of feral hogs in South Carolina. *J. Wildl. Manage.*, 36: 1240-1248.
- Martin, J. T. 1975. Movements of feral pigs in North Canterbury, New Zealand. *J. Mammal.*, 50: 914-915.
- Mauget, R. 1980. Home range concept and activity patterns of the European wild boar (*Sus scrofa* L.) as determined by radio tracking. *In A Handbook on Medical Biotelemetry and Radio Tracking*, C. J. Amlaner, Jr. and D. W. MacDonald (eds.), Pergamon Press, Oxford, pp. 725-728.
- Mohr, C. O. 1947. Table of equivalent populations of North American small mammals. *Amer. Midl. Nat.*, 37: 223-249.

- Roberts, T. J. 1977. The Mammals of Pakistan. E. Benn, London. 361 pp.
- Samuel, M. D. and E. O. Garton. 1985. Home range: A weighted normal estimate and tests of underlying assumptions. J. Wildl. Manage., 49: 513-519.
- Shafi, M. M. and A. R. Khokhar. 1986. Some observations on wild boar (*Sus scrofa*) and its control in sugarcane areas of Punjab, Pakistan. Bombay J. Nat. Hist. Soc., 83: 63-67.
- Singer, F. J. 1981. Wild pig populations in the national parks. Environ. Manage., 5: 263-270.
- Singer, F. J., D. K. Otto, A. R. Tipton and C. P. Hable. 1981. Home ranges, movements, and habitat use of European wild boar in Tennessee. J. Wildl. Manage., 45: 343-353.
- Williamson, M. J. and M. R. Pelton. 1971. New design for a large portable mammal trap. Proc. Ann. Conf. SE Assoc. Fish Game Comm., 25: 315-322.
- Wood, G. W. and R. E. Brenneman. 1980. Feral hog movements and habitat use in coastal South Carolina. J. Wildl. Manage., 44:420-427.

