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Seasonal Changes in the Abundance of *Bandicota bengalensis* in Irrigated Croplands, Faisalabad, Pakistan

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Abstract: In wheat-sugar-cane-fodder agro-system the pattern of abundance and movement of the bandicoot rat (*Bandacota bengalensis*) was studied. The area was divided into six blocks each of 25 acers in size. Each month 8 acers of land under wheat, sugar-cane and fodder crops was randomly selected and sampled for the rat, using snap traps. Sugar-cane was found to be the most preferred crop by the bandicoot rat; the average trap success being 4.10%. This crop provide shelter to the rats almost throughout the year. Fodder crops were next to the sugar-cane in order of preference crop having an average trap success 1.35%. This crop also provide shelter to the rats throughout the year. The bandicoot rat started moving into the wheat crop in February and started feeding on wheat plants in booting stage. The rat attained peak abundance in the wheat crop in March and April. The average trap success for this crop was noted as 0.82%. The fall season is the best time and the sugar-cane and fodder crops are the best sites for applying the rodenticides.

Key words: Bandicoot, abundance, seasonal change, trap success

Introduction

Rats are of great economic importance because they attack food grains at almost every phase of growth and storage. In Pakistan, a number of species of rats and mice destroy the standing agricultural crops. Of those, the bandicoot rat (*Bandicota bengalensis*) is considered to be the most destructive of all the rodent pests of agriculture. Until recently, the bandicoot rat was thought to be absent from the central Punjab. There is now a clear evidence that this specie is present not only over most of the Indus plain but almost all over the Indo-Pak Sub-continent; (Bindra and Sagar, 1977, Greaves *et al*., 1975). The damage it inflicts on such important crops as wheat, rice and sugar-cane is colossal. According to Beg *et al*. (1977, 1988) wheat worth over Rs. 52 crores is destroyed annually by rodents including the bandicoot rat in the fields in the province of Punjab, Pakistan in pre-and post-harvest phases of the crop. According to Roberts (1977) rice worth Rs. 19 crores is wasted annually by the field rats in Pakistan. Rodent losses to sugar-cane crop are also threatening. In recent years rodent damage to sugar-cane crop has greatly increased (Beg *et al*., 1979). The bulk of the damage to the cane crop is due to the bandicoot rats. The distribution and abundance of rodents in the cultivations of Pakistan is complex. This complexity is due to the vegetation heterogeneity that results from the practice of planting of a variety of crops in small size fields which give a look of vegetational mosaic to the croplands. This vegetational heterogeneity offers alternate habitats to the rodents almost throughout the year. When one crop is harvested, they easily find cover and food in some other adjacent crop. This pattern of cropping thus gives protection to the rats and mice population from the disastrous decline in populations (following harvesting of crops) as it often witnessed in the monocrop system.

Rana and Beg (1976), Beg and Ajmal (1977) and Adeeb (1978) have documented information about the reproductive biology, population structure, relative abundance and ecological distribution of rats and mice infesting the cropland of the central Punjab, Pakistan. The impact of rodents on some agriculture crops has been described by Beg *et al*. (1977, 1978, 1979). Salam (1978) studied ecological distribution and field identification of the bandicoot rat in the croplands of the Punjab, Pakistan. The author reported that the bandicoot rats were rarely found excavating burrows during day hours. Yasin (1979), studied the micro-distributions, abundance and economic importance of rodents in the agricultural fields of central Punjab. The author observed that sugar-cane fields served as the reservoir sub-habitat to the bandicoot rat is the cropland. From the cane fields bandicoot rat is migrated to the maturing wheat crop. Sarwar (1981) studied the pattern of rodent infestation in the wheat

fields. The author noted that *Bandicota bengalensis* began infesting the crop when it was in late tillering and booting stages and stayed there in the fields even after harvesting.

Ubaidullah *et al.* (1989) reported 0.51 kg of wheat grains per burrow of bandicoot rat located in recently harvested wheat fields. Ikram (1981), studied the rodent pests of agriculture. The author reported that the sugar-cane fields served as a reservoir for *Bandicota bengalensis*. Ali (1986) reported that the average per acre burrow density of the bandicoot rat in wheat, rice and sugar-cane crops was 2.7, 1.6 and 4.7, respectively. Several other studies has also been conducted about the population and damage caused to crops by the rodents (Murray and Dickman 1997; Anderson and MacMahon (2000); Eccard *et al.* (2001); Giannoni *et al.* (2000).

The present study is being envisaged to investigate the changes in abundance and dispersion of the bandicoot rats in wheat, sugar-cane and fodder crop areas irrigated by canals.

Materials and Methods

The studies on the distribution and seasonal changes in the abundance of the bandicoot rat (*Bandicota bengalensis*) extended during 1988 and 1989. The study area was located some 15 kilometers away from Faisalabad city near the village 61 J.B. (Central Punjab) along with the Jhang Branch of the irrigation canal. The major crops of this area are wheat, sugar-cane, maize, millet and fodder along with vegetables. For the trapping of *Bandicota bengalensis* the area was into six blocks.

A total of 80 snap-traps were used each night for five consecutive nights to sample the selected fields. Each acre of the selected fields was served with 10 rat traps. The rat traps were the metallic, rat traps (18 x 12 cm^2) available were set at five stations. At each station was served with two traps. Four of the five stations were usually located near the four corners, (about 7 to 8m inside the field) and the fifth station was usually located near the centre of the field.

The traps were set at about dusk and collected the next morning at about sun rise. Each trapped specimen was given a field number before being put into separate cellophane bag and brought to the laboratory for autopsy. Most of the specimens were frozen before being autopsied. A record was maintained for the number of traps set in different types of the crops and the species and number of animals captured from there. Each captured specimen was weighed and its external body measurements were taken before being autopsied for the reproductive data. Trap success was used as an index of the population density of the rat in each crop and season. Changes in the vegetation cover of the whole study area were also recorded.

Results and Discussion

The trap success of *Bandicota bengalensis* in different crops, recorded during this study program are as under:

Wheat: The wheat fields were sampled for *Bandicota bengalensis* during four months extending from January to April, 1989. A total of 17 acres of the wheat fields, three in January, four in February, five in March and again five acres in April, were trapped. Harvested wheat fields were also sampled. January trapping did not yield any specimen of the bandicoot rat, whereas in February, March and April the respective trap success was 0.50, 1.60 and 0.80%. On the other hand May and June trapping in harvested wheat fields met very low trap success (Fig.1).

Sugar-cane: Sugar-cane crop was sampled during each of the 11 months of this study. In all 18.50 acres of the crop were trapped using 925 trap nights. The monthly trap success varied from 0.00 to 16.00% (Fig.1). The average trap success for all the 10 months was 4.10%.

Fodder: Fodder crops were sampled every month from August, 1988 to June, 1989. A total of 26.5 acres of the fodder was sampled employing 1325 trap nights. In August 5.33% trap success, September trap success nil, May 2.85% trap success and June 2.00% trap success in graminoid fodders were trapped and during the remaining seven months leguminoid fodders were sampled (Fig.1). The average trap success in the graminoid and leguminoid fodder for the 11 months was 1.35%.

It is evident from the results presented above that in the wheat-sugar-cane-fodder agro system of Faisalabad district, sugar-cane seems to be the most preferred crop by the bandicoot rat. This crop provided shelter to the rats almost throughout the year and was found most heavily infested of all the crops grown in this study area. These findings are in conformity with the results of Beg *et al.* (1979). The second best preferred crop by the bandicoot rats were the fodder crops which are comprised of three or four species of graminoid plants and of three species of leguminous plants. Like the sugar-cane crop, the fodder crops also provide shelter to the bandicoot rats for the most part of the year.

The next best preferred crop was the wheat. The

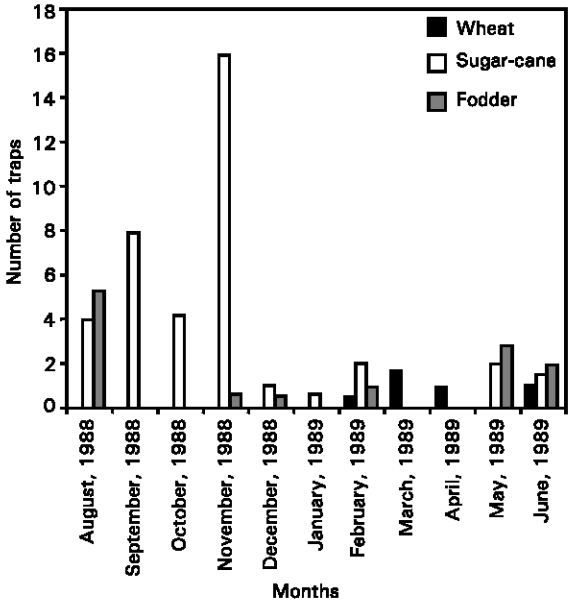

Fig. 1: Trap success percentage on *Bandicota bengalensis* in the field area of wheat, sugar-cane and fodder crops

bandicoot rats start moving into the wheat crop in February and according to the findings of this study, they seem to move into wheat crop from sugar-cane and fodder crops. Beg *et al.* (1983) reported that the bandicoot rat began attacking the wheat crop when wheat plants were in booting stage which generally occurs in February. Beg *et al.* (1980) noted that the bandicoot rat reached peak abundance in the wheat crop in March and April, in the fodder crops in May and June and in the sugar-cane crop in October and November. This is in general agreement with the results of this study. However, some of the bandicoot rats stay in the harvested wheat fields. The female bandicoot rats which stay in the harvested wheat fields are mostly pregnant or nursing their young. Here they hoard wheat grains in the burrows so that they may have a consistent supply of food during this critical part of their life (Beg *et al.*, 1988)

In spite of high rate of reproduction during March and April, the number of bandicoot rat in the cropland did not increase considerably in May and June. Perhaps during the hot and dry period of late spring and early summer when there is less vegetation cover in the croplands, most of the rats die due to unfavourable environmental conditions and predation. Or, the rats emerge from the maternal burrows several months after the spring peak in reproduction. But, there is no evidence for this much delayed emergence and recruitment to the population. Most probably the bandicoot rat pay a very high price, during late spring and early summer, for living and exploiting the rich resources of the wheat-sugar-cane-fodder agro-system. The results are also in conformity with the findings of Murray and Dickman (1997); Anderson and MacMahon (2001); Eccard *et al.* (2000); Giannoni *et al.* (2000).

Based on the results, it is envisaged that the fall season is the best time and the sugar-cane and fodder crops are the best sites for applying the rodenticides, It is hoped that the use of rodenticides according to the proposed season may provide sufficient protection to sugar-cane, wheat and fodder crops from bandicoot rat.

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