

THE BANDICOOT RAT INVADES PUNJAB*

Mirza Azhar Beg** and Akbar Ali Khan**

ABSTRACT

The geographic distribution of the bandicoot rat *Bandicota bengalensis* has greatly changed in Pakistan in recent years. It has colonized the cultivations of central Punjab in large numbers and is heading south-west. Increased use of irrigation, and multiple and continuous cropping involving cultivation of sugarcane seem to have favoured expansion in its geographic range.

INTRODUCTION

In recent years, the bandicoot rat (*Bandicoota bengalensis*) has emerged as the most damaging and widespread pest of the croplands of Pakistan. It inflicts severe damage on sugarcane, wheat and rice crops (Greaves *et al.*, 1977; Beg *et al.*, 1977, 1979; Fulk *et al.*, 1981). According to Ellerman (1961) two separate populations of this rat exist in Pakistan, *B. bengalensis wardi* in Kashmir, northern Punjab, and southern N.W.F.P., and *B. bengalensis kok* in Sind and southern Punjab. About a century ago the bandicoot rat was recorded in Sind by Murrey (1884) from around Jathi and Keti Bandar in Thatta District, Umarkot in Tharparkar, and extreme north of Jacobabad District. But, Roberts (1977) and Smiet *et al.* (1978) are of the view that the rat is either extremely rare or absent from the districts of upper Sind and has not yet been able to spread to any of the drier regions of the southern Punjab. In the flood plains of lower Sind it was once so prevalent and destructive to the rice crop that Wagle (1927) considered it to be one of the three probable chief causes (the others being malaria and seasonal flooding) of the lack of development in this region. More recently, as a result of construction of irrigation

*This work was conducted under the Pakistan Science Foundation Grant No. PSF/RES/P.A.U/Bio/10/1).

**Department of Zoology & Fisheries, University of Agriculture, Faisalabad.

canals and barrages over the Indus and consequent interference with the annual inundation, these plains have been turned into saline wastes and rendered less suitable for the rat.

The northern subspecies was reportedly restricted to a few locations in Kashmir (Ellerman and Morrison-Scott, 1951). Its presence in most of the NWFP and Punjab was not recorded till the expedition of the University of Maryland in 1965. The collections of this expedition revealed that the rat had already extended its range as far south-west as Sheikhupura. It had, however, not yet entered Faisalabad, Sargodha and Jhang Districts; an intensive sampling by Taher *et al.* (1967) in 1963-64 in these districts did not reveal its presence. By early seventies, however, the rat had colonized these districts in fairly large numbers and is now advancing south-west. Presently, it has reached, at least the environs of Sahiwal city.

REASONS FOR RAPID INCREASE IN GEOGRAPHIC RANGE

1. *Physical, Behavioural and Demographic Traits* : A direct answer to the question "why has the rat been so successful in the croplands of the Punjab", is not presently available. But, it is not difficult to imagine how the bandicoot's physical superiority and some of its demographic and behavioural traits might have provided it a competitive edge over other murid competitors inhabiting the cultivations. The bandicoot rat is a strong and sturdy rat which may weigh upto 275 gm. It is a fierce and aggressive animal and can often be heard emitting grunting noise at intruders from its burrow entrance. It can feed on birds and young rats and mice (Frantz, 1973; Chakraborty, 1977). Being bold and aggressive it may possibly also defend itself against mon-gooses and water snakes. It is a good swimmer (Wagle, 1927) and takes to water readily and for this reason it may not be so susceptible to floodings as are the other rats.

The bandicoot is a very prolific rat. Over most of its range it breeds round the year, but in the Punjab it becomes reproductively quiescent during the colder months of winter (Beg *et al.*, 1981). It produces 3 to 11 young at a time but under favourable conditions the females are known to litter 14 to 18 young

upto 12 times in a year (Wagle, 1957; Spillett, 1968). Table 1 compares the reproductive performance of different populations of the bandicoot rat. Even a cursory look at this table is sufficient to convince that the Calcutta and Punjab populations are outstanding for their very high productivity. Table 2 attempts interspecific comparisons of some of the reproductive traits of the major murid pests of agriculture. As it is evident from the table both *Mus musculus* and *Rattus meliada* have higher prevalence and incidence of pregnancy than the bandicoot rat, yet because of larger litter size, the annual productivity of 75.2 young per female of the bandicoot approximates that of the house mouse population. Thus, the bandicoot rat is reproductively superior to most of these species and has the potential of building up its population rapidly. These traits confer competitive superiority upon the bandicoot rat when compared with other murids inhabiting the croplands of the Punjab. In fact, it has demonstrated superiority by becoming the most dominant species in irrigated croplands of Punjab.

Table 1. Reproductive rates of *Bandicota bengalensis*

Locality & habitat	Per cent preg.	Incid. of preg.	Emb. per female	Production per female per year	References
Calcutta Godowns					
Maharishi-Debendra Rd	49.4	10.6	5.9	62.6	Spillett, 1968
Canal East Rd	55.8	12.0	6.4	76.6	Spillett, 1968
Rangoon: Urban population	27.5	5.9	7.4	43.7	Walton <i>et al.</i> , 1978
Lower Sind: Rice field	14.8	1.6	8.9	28.2*	Fulk <i>et al.</i> , 1981
Lower Sind: Sugarcane	30.8	6.7	8.5	43.6**	Smist <i>et al.</i> , 1980
Punjab: Cropland	47.4	10.2	7.4	75.2	Khan, 1982

* Production during seven months

** Production during five months

Bandicoot Rat

2. Effect of Cropping Pattern

In Pakistan, the bandicoot rat was originally confined to southern Sind and Himalayan foothills in the north east. This type of distribution is characteristic of those Oriental faunal zone species which prefer mesic conditions and used, avoiding the central arid zone, the better watered tracts along the Himalayan foothills in the north-east and the coastal plain in the extreme south to enter into Pakistan (Roberts, 1977). Being a species of mesic habitat, the bandicoot rat remained confined to these two areas in Pakistan until suitable habitats in the form of swamps and croplands were created in the interior. Widespread invasion of the croplands was, however, not possible till multiple cropping involving cultivation of sugarcane began to be practised.

Table 2. Reproductive patterns in the females of some local murid populations

Locality & species	Per cent preg.	Incid. of preg.	Emb. per female	Production per female per yr.	References
Punjab					
<i>Mus musculus</i>	51.1	12.4	6.2	78.6	Khan, 1982
<i>Bandicota bengalensis</i>	47.4	10.2	7.4	75.2	"
<i>Rattus meliada</i>	54.1	12.3	5.3	65.1	"
<i>Tatera indica</i>	33.6	7.0	6.8	47.3	"
<i>Nesokia indica</i>	30.0	6.4	4.1	25.6	Beg et al. 1981
<i>Rattus rattus</i>	48.0	10.5	6.2	65.0	Beg et al. (unpublished)

Monocultures may provide sustenance to the rats but only for a limited period of time; once the crop is harvested they must find alternate resources. Consequent upon this fact, only those monocultures which happened to be close to reservoir habitats such as swamps, reed-beds and stands of tall grasses were haunted by the bandicoot rat. After their exploits in monocultures, the rats must return to the reservoir habitats and wait till the next crop was ready. The practice of growing two or more crops from the same fields located close to reservoir habitats would, of course, prolong the rat's stay in such croplands.

In other words, vegetational heterogeneity resulting from continuous and multiple cropping would decrease the rat's dependence on reservoir habitats. But most of the crops, with the exception of sugarcane, are of short duration and as such do not insure continued sustenance. Thus, complete breakaway of the rats from the reservoir habitats was not possible till tall and dense stands of sugarcane with a micro-environmental semblance of the reservoir habitats were also added to the agro-ecosystem. Using scattered stands of sugarcane in place of reservoir habitats, the rats extended their range deep into the croplands by hopping from one cane field to another. The cane fields provided the rat not only food and shelter but also insured an easy access to the rich and abundant nutrients seasonally available in nearby multicultures. Hence, the range of distribution of the bandicoot rat in the croplands of Punjab has been tied with the cultivation of sugarcane. All the sugarcane growing tracts in central Punjab are now heavily infested with the bandicoot rat. As and when sugarcane cultivation extends further southwest, the rat will go with it. Thus, increased use of irrigation, continuous and multiple cropping involving cultivation of sugarcane provided the bandicoot rat rich and continuously available food and substrate. The rat responded to these ecological changes by extending its distribution from the north-eastern foothills to the cultivations of the Indus plains of Punjab.

THE DANGER OF BECOMING AN INDOOR PEST

Another very interesting aspect of the life of the bandicoot rat is its ability to infest urban godowns, shops and human dwellings. It has become a close commensal of man. In such rapidly expanding cities as Bombay, Delhi, Calcutta, Madras, and Rangoon it has assumed the role of a dominant indoor pest (Rao, 1947; Harrison, 1949; Deoras, 1966; Seal and Banerji, 1966). In Pakistan, it has not yet been able to infest any of the big cities although it is present in the compounds of human dwellings located on outskirts of cities, University Campuses, etc.

Why the rat has so far not been able to occupy its indoor niche in Pakistan? Again, there is no direct answer to this question. Both *R. norvegicus*

Bandicoot Rat

cus and *R. rattus*, which have yielded repeatedly to the bandicoot in India and Burma, are not much of a competitor to prevent it from taking over the indoor habitat in Pakistan. Nor, any of the physical factors of the environment can conceivably be important in this respect. If the rat is not constrained by the physical factors of the environment in the nearby agricultural fields and kitchen gardens, how can they be effective in checking it from occupying the indoor habitat? Perhaps the reason is a psychological one. This psychological barrier may be broken any day and the rat may become a serious indoor pest also.

REFERENCES

- Beg, M. A., A. A. Khan and M. Yasin, 1977. Rodent damage to wheat crop in Faisalabad district. Pak. J. Agri. Sci. 14 : 37-44.
- Beg, M. A., A. A. Khan and F. Begum, 1979. Rodent problem in sugarcane fields of central Punjab. Pak. J. Agri. Sci. 16 : 123-129.
- Beg, M. A., N. Adeeb and S. A. Rana, 1981. Observations on reproduction in *Bandicota bengalensis* and *Nesokia indica*. Biologia, 27 : 45-50.
- Chakrabarty, S. 1977. Field observations on the biology and ecology of the lesser bandicoot rat, *Bandicota bengalensis* (Gray), in West Bengal. All India Rodent Seminar, Ahmadabad (India), September 1975. pp. 102-109. Krishnamurty, K., Chaturvedi, G.C. and Prakash, I. (Eds). Sidhpur : Rodent Control Project.
- Deoras, P.J. 1966. Significance of probable change of rat population in Bombay. Proc. Indian Rodent Symposium, Calcutta, 1966. pp. 58-68.
- Ellerman, J.R. 1961. Mammalia. In : The Fauna of India (Ed: M.R. Roonwal), Vol. 3, Second Edition, Calcutta.
- Ellerman, J.R. and T.C.S. Morrison-Scott, 1951. Check list of Palearctic and Indian Mammals. 1758 to 1946, British Museum (Natural History), London.
- Frantz, S. C. 1973. Behavioural ecology of the lesser bandicoot rat, *Bandicota bengalensis* (Gray) in Calcutta. Ph. D. Thesis, The Johns Hopkins Univ. Baltimore, Maryland. pp. 222.
- Fulk, G.W., S.B. Lathiya and A.R. Khokhar, 1981. Rice field rats of lower

- Sind : abundance, reproduction and diet. *J. Zool.* 193 : 271-290.
- Greaves, J.H., M.A. Chaudhry and A.A. Khan. 1977. Pilot rodent control studies in rice fields in Sind, using five rodenticides. *Agro-Ecosystem*, 3 : 119-130.
- Harrison, J.L. 1949. The domestic rats of Malaya. *Med. J. Malaya*, 4:96-105.
- Khan, A.A. 1982. Biology and ecology of some rodent pests of agriculture in central Punjab. Ph.D. thesis, Univ. of Agriculture, Faisalabad, Pakistan. pp. 152.
- Murray, T.A. 1984. The Vertebrate Zoology, of Sind. Richardson, London.
- Roberts, T.J. 1977. The Mammals of Pakistan. Earnest Benn Ltd., London.
- Rao, R.S. 1937. Role of field rats in plague. *Indian Med. Gaz.* 82 : 96-101.
- Seal, S.C. and R.N. Banerji. 1966. Changing pattern of rodent population in Calcutta and Howrah. *Proc. Indian Rodent Symposium, Calcutta*, 1969. pp. 59-63.
- Smiet, A.C., A.R. Khokhar and G.W. Fulk. 1978. Geographic distribution and variation of *Bandicota bengalensis* in Pakistan. *Pak. J. Zool.* 43-47.
- Smiet, A.C., G.W. Fulk and S.B. Lathiya. 1980. Rodent ecology in sugarcane in lower Sind Pakistan. *Acta Theriol.* 25 : 81-97.
- Spillett, J.J. 1968. The ecology of the lesser bandicoot rat in Calcutta. Ph. D. Thesis, The Johns Hopkins Univ. Baltimore, Maryland. pp. 223.
- Taber, R.D., A.N. Sheri and M. S. Ahmad. 1967. Mammals of the Lyallpur region, West Pakistan. *J. Mammal.* 48 : 392-407.
- Wagle, P.V. 1927. The rice rats of lower Sind and their control. *J. Bombay Nat. Hist. Soc.* 32 : 330-338.