March 1992

REINFESTATION OF BANDICOTA BENGALENSIS (GRAY) IN IRRIGATED FIELD HABITAT

B.K. Guruprasad
AICP on Rodent Control, University of Agricultural Sciences, GKVK, Bangalore—560 065. India

REINFESTATION OF BANDICOTA BENGALENSIS (GRAY) IN IRRIGATED FIELD HABITAT

B. K. GURUPRASAD, AICP on Rodent Control, University of Agricultural Sciences, GKVK, Bangalore—560 065. India

ABSTRACT: *Bandicota bengalensis,* a predominant species inhabiting irrigated fields is a potential pest on agricultural crops and is known to live in extensive burrow systems. The burrow opening covered with mud which is an indicator of its activity seems to be discontinuous. An analysis of burrow systems and their occupations indicated reuse of abandoned burrow systems by new entrants. A study simulated in semi-natural conditions supported the view that there is occupation of old burrows by new immigrants. Non-effective barriers; and availability of *Panicum repens* on bunds, a food alternative may support the population influx. Availability of old burrow systems due to chemical control and natural predation often result in a ready made habitat for the immigrants, and new recruits to reinfest the irrigated fields. Total dismantling of the burrow system and agricultural practices in irrigated field retards the reinfestation.

Proc. 15th Vertebrate Pest Conf. (J. E. Borrecco & R. E. Marsh, Editors) Published at University of Calif., Davis. 1992

INTRODUCTION

Rodent infestation in irrigated agricultural crop fields result in damage from tillering stage to harvest. Among the rodent pest species, *Bandicota bengalensis* (Gray) is known to be predominant pest in irrigated fields (Roy 1974). The lesser bandicoot rat (*Bandicota bengalensis*) is a solitary rat and occupies a single burrow system (Greaves et al. 1975). Its agonistic behaviour help in spatial distribution in irrigated fields. The burrow systems are complex and usually on the bunds. Burrow openings are closed with a heap of mud except during the harvest season (Chakraborthy 1975). Bandicoot rat is known to have adopted to its habitat by feeding on ginger grass (*Panicum repens*) present extensively on bunds during non-availability of food in the crop fields (Guruprasad 1984).

The control measures adopted against this Bandicoot rat include traditional catching by digging the burrows. But the most recommended method is chemical control using rodenticides, based on feasibility of adoption by farmers. Immaterial of the rodenticide used methodology involve baiting at the burrow opening and closing after baiting. To achieve satisfactory control of Bandicoot rat population, recommendations are based on breeding potential and population level so as to minimize the crop losses. Such control measures lead to unaltering of the habitat with burrow system intact killing only its occupant resulting in readily available burrow systems for new immigrant.

Impact of availability of unoccupied burrow systems on the rate of reinfestation of Bandicoot rat population in irrigated field has not been worked out. Though habitat alteration is recommended to achieve effective control (Barnett and Prakash 1975) and in ground squirrel total destroying burrows would increase effectiveness of control (Storer 1945) and slower the recolonisation (Linsdale 1945).

With this background, pilot studies were aimed at testing reutilization of unoccupied/deserted burrow systems by Bandicoot rats and its influence on recolonization from adjacent fields in irrigated field habitat after chemical control.

MATERIAL AND METHODS

Study area—Rattary

Burrow reoccupation was studied in a rattary at Agricultural Research Station belonging to the University of Agricultural Sciences, Nagenahalli, Mysore District, Karnataka, South India. Bottom of the rattary was covered with 30 cm soil. One Bandicoot rat of each sex was released for a month into the rattery and were allowed to dig extensive burrow systems. Without disturbing burrow system, the residents were removed by trapping. Ten Bandicoot rats of each sex were released individually. Observations were then recorded whether the released rats would reuse the unoccupied burrow system or make their own fresh burrow system/s.

Field Study

Ten acres of experimental plot in irrigated fields in the Regional Research Station, Mandya, Karnataka, were selected for mapping the burrow loci. Paddy, Ragi and Groundnut in Kariff and Sugarcane through out the year were grown in experimental plots. For recording continuity of activity, individual burrows were numbered 1 to 20 and active burrows were continuously mapped for three days in a month for a period of eight months. Active burrows close to one meter from the numbered burrows were considered as the same old active ones. Since Bandicoot rats attain sexual maturity in about three months, percent of burrows active consistent for three months were recorded before their burrow excavation.

Next month (March 1987) after eight months of mapping, the active burrows were excavated and animals were caught. Based on the data on burrow dimension, activity consistence, sexual status, tail length and body weight, the captured rat occupants were classified as new immigrants and old residents.

Adjacent to the experimental plot of burrow destruction, another 10 acres of similar irrigated fields with active burrows were utilized for chemical control by zinc phosphide followed by aluminium phosphide fumigation. Active burrows were counted/mapped in both experimental and chemically controlled fields for a further period of eight months continuously for population invasion from adjacent plots. The data were analysed by student 't' test with regard to population growth in an unaltered and altered habitats, respectively.

RESULTS

The introduced Bandicoot rat in absence of resident one always used the deserted burrow system initially in both the simulated study, indicating reuse of deserted burrow system by new entrant into the rattery. Nineteen percent of the new

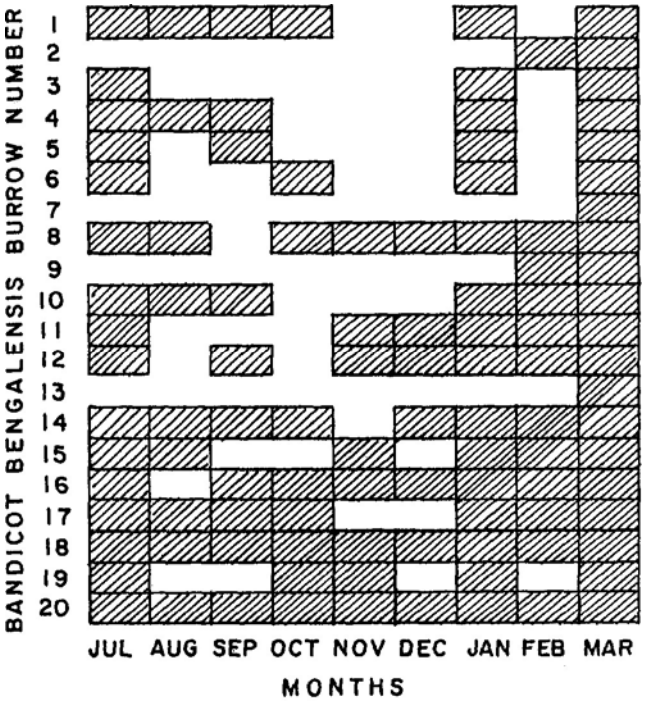

Figure 1. Continuity of activity in Bandicoot rat burrow systems in 10 acre area from July to March at Regional Research Station, Mandya, Karnataka, South India, 1986-87.

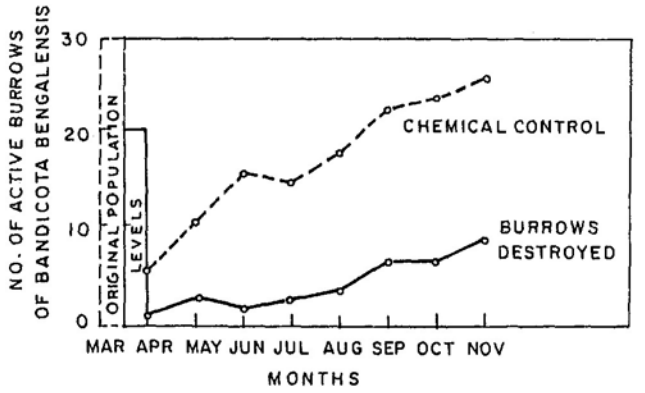

Figure 2. Number of Bandicoot rat reinfestings known to be active during each month on the plots without burrow systems (treatment: solid line) and with burrow systems (control: dotted line) at Regional Research Station, Mandya, Karnataka, South India, 1987.

entrants made new burrow later.

Mapping active burrows indicated both continuous and discontinuous activity at the same burrow loci (Fig. 1). Ten percent of the burrows were active consistently during the observation period and 90 percent of the burrows were active intermittently indicating high percent of utilization of burrow systems. Out of 90%, 50% of the burrows were active consistently during last three months of observations period and 40 percent of burrows were active only during the month of excavation. Thus showing that deserted burrows are reused immaterial of the duration of unoccupancy by earlier Bandicoot rat.

Out of 90% of the reinfesting population, 30% of the immigrants were sub adults and 60% were adults at the time of capture (Table 1). 45% of the immigrants had settled in the experimental plot during the study and 15% of the adult population had reoccupied burrows during the month of excavation. The burrow having consistant activity through out the surveillance period were adults. Capture of higher percent of sub adults in higher ramified burrows with intermittent activity period indicated that the infesting population was mainly by sub adults.

Population build up in chemically controlled plot compared to burrow destroyed plot was significantly higher ($P > 0.1$). In the observation period of eight months, the population in chemically controlled plot with old burrow intact was rebuilt to the extent of 86.67 percent, but in the plot with destroyed burrow system, it was only 45 percent indicating the importance of old burrows in reinfestation of Bandicoot rats in irrigated fields (Fig. 2).

The rate of rebuilding was significantly higher in the initial three months ($P > 0.1$) in control plot with intact burrows but from fourth month onwards, recolonisation in the experimental plot and control plots were almost similar. Absence of burrow system could retard reinfestation of Bandicoot rat in irrigated field to the extent of 41.67% compared to that of chemical controlled field with intact burrows.

DISCUSSION

In managing the rat population to non-infestation level, habitat management suggested to reduce carrying capacity which in turn also check population inflow into a crop field has met with little success (Southwood 1977, Barnett and Prakash 1975). For example reduction of the bund height, as this totally depends on contour of the area. The habitat in irrigated fields also has ginger grass (*Pancium rep-ens*) as an alternative food supply for sustenance of Bandicoot rat population (Guruprasad 1984), has hampered habitat management in checking population reinfestation. Present study has indicated the reuse of unoccupied burrow systems in irrigated field habit. Such reoccupation of burrows has been a major factor in the ground squirrel population (Linsdale 1946). Due to lack of effective barrier system in irrigated fields movement of Bandicoot rat is not restricted. The induction of sub adult Bandicoot rat population, the major factor in reinfestation may be due to breeding potential and availability of food (Montgomery et al. 1991). Chemical control suggested to farmers have led to unaltered habitat with presence of unoccupied burrow systems is one of the major factors responsible for a quicker reinfestation of rats in irrigated habitat from adjoining fields.

Absence of burrow systems retard population reestablishment as the requirement of energy is more to install complicated burrow systems. Partial destruction of burrow systems done during agricultural practice of trimming bund will not retard as in the case of ground squirrel (Salmon et al. 1987). Burrow destruction used in combination after chemical control may prove more successful as it involved alteration of habitat and carrying capacity after a control operation is carried out as in European rabbit (*Oryctolagus caniculus*) control in Australia (Cooke 1981, Foran et al. 1985). The present study has indicated that complete burrow destruction retard Bandicoot rat population reinfestation as reported by Storer (1945) for an effective ground squirrel management. Burrow distruction may be cost effective as burrow system are mostly on bunds in irrigated fields. Total reconstruction of bund instead of partial reconstruction by way of trimming undertaken by farmers can be recommended as it involves marginal increase in the cost of labour input.

Table 1. Percent reoccupancy of *Bandicota bengalensis* and its burrow systems in study area at Regional Research Station, Mandya, Karnataka, during 1986-87.

Burrow No.	Total length of burrow system (mts)	Duration of continuous activity before excavation (in months)	Sex	Weight (gm)	Tail length (cms)	Sexual status	% reoccupancy
1	15.65	1	F	74	8.3	Sub-adult	
2	9.40	2	F	80	8.8	Sub-adult	
3	11.27	1	F	87	9.5	Sub-adult	
4	13.65	1	F	80	8.4	Sub-adult	30
6	6.37	1	M	100	8.9	Sub-adult	
13	0.90	1	M	80	9.3	Sub-adult	
5	5.85	1	F	192	11.5	adult	
7	3.68	1	M	211	12.7	adult	15
19	10.50	1	M	200	12.5	adult	
8	10.72	6	F	180	12.1	adult*	
9	11.40	2	F	227	12.5	adult*	
10	8.40	3	M	192	11.7	adult	
11	14.48	5	F	240	12.3	adult*	
12	13.65	5	F	198	12.1	adult*	45
14	15.10	4	F	210	12.6	adult*	
15	13.20	3	M	240	12.8	adult	
16	19.20	7	F	243	12.3	adult**	
17	16.54	3	F	205	12.7	adult	
18	14.70	9	M	289	15.3	adult	
20	15.28	9	M	273	14.5	adult	

*Lactating **Pregnant

ACKNOWLEDGMENT

The support and facilities provided by the All India Coordinated Research Project on Rodent Control, Indian Council of Agricultural Research, New Delhi and the University of Agricultural Sciences, GKVK for the study are gratefully acknowledged.

LITERATURE CITED

BARNETT, S.A., and I. PRAKASH. 1975. Rodents of Economic Importance in India. Arnold-Heinemann Pub., New Delhi. 66 pp.

CHAKRABORTHY, S. 1975. Field observation on the biology and ecology of the lesser Bandicoot rat, *Bandicota bengalensis* (Gray) in West Bengal. All Ind. Rodent Symp. Pub., Dr. G.C. Chathurvedi, Siddhpur, Gujarat 102 pp.

COOKE, B.D. 1981. Rabbit control and the conservation of native mallee vegetation on road sides in South Australia. Aust. Wildl. Res. 8:627-636.

FORAN, B.D., W.A. LOW, and B.W. STRONG. 1985. The response of rabbit populations and vegetation to rabbit control on a calcareous shrubby grassland in central Australia, Aust. Wild. Res. 12:237-247.

GREAVES, J.H., G.W. FULK, and A. KHAN. 1975. Prelimi- nary investigations of the rice rat problems in lower sind. All Ind. Rodent, Symp. Pub. Dr. G.C. Chathurvedi, Siddhpur, Gujarat. 24 pp.

GURUPRASAD, B.K. 1984. Food habits of *Bandicota bengalensis* (Gray) in crop fields. In: Proc. Sixth Interl. Bio-detet. Symp. Washington D.C. 51 pp.

LINSDALE, J.M. 1949. The California ground squirrel: A record of observation made on the Hastings Natural History Reservation. Univ. California Press, Berkeley. 467 pp.

MONTGOMEREY, W.I., W.L. WILSON, R. HAMILTON, and P.M.C. CARTNEY. 1991. Dispersion in the wood mouse *Apodenus sylvaticae,* variable resources in time and space. J. Animal Ecol. 60 (1) 179-192.

ROY, S.K. 1974. Preharvest loss of rice due to field rodents. Economic & Political Weekly. 9 :66-67.

STORER, T.I. 1945. Field rodent control by destruction of burrows. J. Wildl. Manage. 9:156-157.

SOUTHWOOD, T.R.E. 1977. Habitat the templet for ecological strategies? Presidential address to the British Ecology Society. 5 January 1977. J. Anim. Ecol. 46:337-365.

SALMON, T.P., R.E. MARSH and D. STROUD. 1987. Influence of burrow destruction on recolonization by California ground squirrels. Wildl. Soc. Bull. 15: 564 - 568.