

RODENT

Newsletter

Vol. : 27 (1-2)

2003



ALL INDIA COORDINATED RESEARCH PROJECT ON RODENT CONTROL

**Central Arid Zone Research Institute
Jodhpur - 342 003, India**

RODENT

Newsletter

Vol. : 27 (1-2)

2003

CONTENTS

1. The role of wild and peri -domestic rodents in maintaining epidemiological cycle of plague
 - **Shyamal Biswas, Sohan Lal, Veena Mittal, R. L. Ichhpujani & Shiv Lal** 1
2. Some observations on desert gerbil, *Meriones hurrianae*, inhabiting arid zone
 - **Partap Singh And Hari Shankar** 3
3. Observations on burrows of Indian crested porcupine, *Hystrix indica* Kerr
 - **A.K. Chakravathy, B.B. Hosetti And A. C. Girish** 4
4. Sugarcane damage due to rodents in coastal Andhra Pradesh
 - **D. C. Rajak** 4
5. Ecology based rodent management in Australia and Asia
 - **Grant Singleton** 5
6. Rodent Ecology and Management Course - A Report
 - **P. Neelanaryanan** 6
7. Notes And News 7

AICRP on Rodent Control
 Central Arid Zone Research Institute
 Jodhpur - 342 003, India

The role of wild and peri-domestic rodents in maintaining epidemiological cycle of plague

SHYAMAL BISWAS*, SOHAN LAL*, VEENA MITTAL,
R.L. ICHHPUJANI & SHIVLAL
National Institute of Communicable Diseases,
22, Sham Nath Marg, Delhi- 110 054

Plague continues to exist as a major public health problem in the world. It affected 38 countries with 80,613 cases and 6,587 deaths during the period 1954 to 1997. In Asia endemic foci of plague are found in China, Cambodia, India, Iran, Indonesia, Mongolia, Myanmar, Nepal, Vietnam, Kazakhstan, Philippines, and Saudi Arabia. Though human plague was not reported from India since 1967, yet sporadic cases of suspected human plague were recorded from Himachal Pradesh during 1966 and 1983, Karnataka during 1984 and at times localized sylvatic plague incidence encountered in last decade from Karnataka, Andhra Pradesh and Tamil Nadu. During 1994, an outbreak of bubonic plague in Beed district, Maharashtra and pneumonic plague in Surat, Gujarat were recorded. An outbreak of pneumonic plague was reported from Simla district, Himachal Pradesh during 2002.

Investigation on reservoirs of plague commenced early in 1964 in plague focus of south India at the tri-junction of Andhra Pradesh, Tamil Nadu and Karnataka. National Institute of Communicable Diseases (NICD) in the course of their intensive studies in peninsular India during 1970 detected the presence of plague antibodies amongst small mammals of different species i.e. *Rattus rattus* (0.54 %), *Tatera indica* (4.76 %), *Bandicota bengalensis* (0.6 %), *Millardia melitana* (1.2 %) and *Funambulus palmarum* (8.0 %). A continuous serological and bacteriological surveillance in rodents was carried out in Andhra Pradesh, Karnataka, and Tamil Nadu over the years. Live rodents were collected from wild and commensal /peri-domestic situations by trapping and digging for rodent sera and organ samples. Passive Haemagglutination Test (PHA) and Passive Haemagglutination Inhibition Test (PHI) were performed using F1 antigen to detect the evidence of plague antibodies amongst the rodents. Year wise sero-positivity test results are given in tables 1&2.

Of the total rodents collected, *T. i. cuvieri* (Waterhouse) was by far the most numerous (65.7%). While collecting wild and peri-domestic /commensal rodents, it was seen that *T. indica* was present in all types of farm lands and dry hilly terrain except in wet fields. Mainly *R. rattus* was collected from commensal and peri-domestic situations and constituted 26.7% of the collection. *B. bengalensis* (Gray) constituted 7.6% of the total collection mainly from wet lands /paddy fields in wild and ruderal habitats. From 1989 to 1994 serological evidence of plague was detected in wild and peri-domestic rodents. Percent serio-positivity in rodent population was found to be minimum (0.1%) during 1989-90 and maximum (0.25%) during 1992.

A plague antibody was detected in 243 sera samples in *T. indica*, *R. rattus* and *B. bengalensis*. High sero-positivity (0.5%) amongst rodents tested was found in *T. i. cuvieri*. High sero-positivity rate with *T. indica* in ruderal area wild habitats indicates

* National Institute of Communicable Diseases, Plague surveillances Unit, Bangalore.

that the species has high degree of resistance to *Yersinia pestis* infection and are involved in maintaining the enzootic foci in nature. Sero-positivity in *T. indica* occurred throughout the year but with a peak incidence in September /October. This may be attributed to the breeding activity of *T. indica*, which follows bimodal pattern of reproduction with a peak during October and November in peninsular India. Another factor responsible for peak incidence was the high flea indices i.e. *Xenopsylla cheopis* and *X. astia* during the period. This was the warm season with mean temperature of 23.2/22.9° C with occasional rainfall (Mean total rainfall 182.2/221.4 mm) with RH 78%. Sero-positivity in *R. rattus*, which is considered to be the most susceptible to *Y. pestis* infection indicated that they have developed tolerance to plague infection due to frequent intermingling with wild rodents in ruderal habitats.

Biotic and abiotic factors and topography of peninsular India offers favourable conditions for the extensive breeding of rodents and vector fleas. Hilly terrain in these eco-zones offer further protection to rodent population from unnatural deaths due to food/inundation and human encroachment to their habitats. Rodent epizootics may occur due to migration of reservoir hosts following natural interference with balanced ecological systems. Thus density related factors are the possible cause of outbreak of plague.

Table 1. Sero-positivity test results for plague antibodies amongst wild and peri-domestic rodents from different states in peninsular India during 1989-2001.

Year	Andhra Pradesh Palamner (Chittoor district).			Karnataka (Bangalore Rural and Kolar district)			Tamil Nadu (Dharmapuri and the Nilgiris district)		
	No. of rodent sera tested(+ve)			No. of rodent sera tested(+ve)			No. of rodent sera tested(+ve)		
	Ti*	Bb*	Rr*	Ti*	Bb*	Rr*	Ti*	Bb*	Rr*
1989	6018	86	3230	5034	840	5955	5876	817	1705
1990	6593	99	3505	3555(4)	1526	5999	9727	557	1083
1991	9912(9)	109	4146(4)	8759(4)	3190(4)	9192(17)	8188(12)	252	1553
1992	10718(53)	1387	4291(9)	19290(41)	2217(8)	5122	5766(22)	878	4957(2)
1993	8276(5)	96	5006	18380(8)	2514	5141	7732(8)	137	1882
1994	7787(17)	83	4329	9622(2)	2023	3301	5359(11)	893	1218
1995	9007	95	4539	10243	1714	3070	3750	191	736
1996	8186	97	4878	11930	2196	2837	2817	287	15
1997	7670	89	4117	12346	2752	1248	7543	117	144
1998	5519	79	2997	3640	1752	1200	1997	254	3
1999	4724	92	2257	4231	1308	1285	1515	224	600
2000	4316	118	2047	4349	1405	1047	419	111	512
2001	4657	93	2452	5155	1716	1393	539	22	455
Total	93383 (84)	2523	47784 (13)	116534 (59)	25153 (12)	46690 (17)	61228 (53)	4740	14863 (2)

*Ti: *Tatera indica*, *Bb: *Bandicota bengalensis*, *Rr: *Rattus rattus*

Table 2. Distribution of Sero -positive (*Y. pestis* F1 agglutinins) amongst rodent in peninsular India during 1989 to 1999.

State/District	Rodent sera tested			Number +ve (Percent)		
	Ti*	Bb*	Rr*	Ti*	Bb*	Rr*
Karnataka	4958	6	1726	29(0.5)	1(16.7)	44(2.5)
1. Bangalore rural (Attibele)						
2. Kolar	102090	22026	43524	36(0.04)	11(0.05)	1(0.002)
Andhra Pradesh	84410	21312	43235	87(0.1)	Nil	13(0.03)
1. Chittoor (Palamner)						
Tamil Nadu	60270	4607	13296	55(0.09)	Nil	2(0.02)
1. Dharmapuri						
2. The Nilgiris	188	21	1921	Nil	Nil	Nil

*Ti: *Tatera indica*, *Bb: *Bandicota bengalensis*, *Rr: *Rattus rattus*.

Some observations on desert gerbil, *Meriones hurrianae*, inhabiting arid zone

PARTAP SINGH AND HARI SHANKAR*
Lohia College, Churu (Rajasthan)

The desert gerbil, *Meriones hurrianae* is perhaps one of the most studied mammal of the Thar desert. This ubiquitous rodent of the Thar Desert is the most abundant species in Churu district. Being diurnal in nature desert gerbils can be seen everywhere peeping from burrow openings. It was observed that during monsoon season *M. hurrianae* feeds mainly on *Tribulus terrestris*, sporadically on *Cenchrus satigerus* grass and rarely on seeds from Khejri (*Prosopis cineraria*) pod. In winters when there is paucity of vegetation, the gerbil was found feeding on bark and tender leaves of *Calotropis* and leaves of *Leptadenia pyrotechnica*, *Aerva persica* and *Abutilon* species. The gerbil never remained far away from its burrow openings. The maximum distance it travelled from its burrow was 11 meters. It hurriedly picks up the food (a branch of vegetation) and returns to burrow opening where it consumes it. If any danger is evident, it will take the branch into the burrow and feed on it in the burrow chamber.

Good population of *M. hurrianae* attracts many predators in the region. Booted Hawk Eagle (*Hieraaetus pennatus*), a migratory bird in the region was

* Central Sheep and Wool Research Institute, Avikanagar (Rajasthan)

found feeding on this species. Shikra (*Accipiter badidius*) and Black-shouldered Kite (*Elanus caeruleus*) are other predominant avian predators of this gerbil.

Observations on burrows of Indian crested porcupine, *Hystrix indica* Kerr

A.K. CHAKRAVARTHY, B.B. HOSETTI* AND A.C. GIRISH
Department of Entomology, ZARS (UAS), V.C. Farm, Mandya, Karnataka - 571405

Field study was conducted during 2001-03 to study the burrowing activity of porcupine in Shimoga, Hassan, Chikmagalur and Dakshina Kannada district in Western Ghats region of Karnataka, Gir forest in Gujarat and in the campus of Kerala Agricultural University, Thrissur. In Dakshina Kannada, the burrows were found uplands where red sandy gray soils were covered with dense growth of shrubs mainly of *Ziziphus*, *Acacia*, *Lantana* and *Chromola* bushes. Other burrows were found in evergreen forests dotted with coconut (*Cocos nucifera*) and areca nut (*Areca catechu*) plantations. In Gir (Gujarat) the burrows were found along the slopes at the base of the trees like *Butea*, *Ziziphus*, *Ficus* etc. or beneath the rocks. Along the slope small burrows with multiple openings and under the rocks large burrows with large openings were located. In Kerala, again it was located in an open elevated patch at the base of trees like *Ficus*.

Based on the size we categorized the burrows as large and small. The active burrows were identified by the presence of pug marks, faecal pellets, quills, runway paths, littering of food items like fibers of coconut husk, chewed up Cashew nuts etc. The openings of the active burrows are maintained clean, whereas the inactive burrows had lot of leaf litter deposited at the entrance with no other signs of animals' presence inside. The small burrows were under soil with a central big den having two side openings. In large burrows there might be a resting and breeding chambers separately.

Sugarcane damage due to rodents in coastal Andhra Pradesh

D.C. RAJAK
Indian Institute of Sugarcane Research, Lucknow -226 002

Rodent damage to sugarcane was recorded in the command areas of three sugar mills namely KCSF Ltd. Kovur, Empee Sugars Ltd. Naidupeta and Gayatri Sugars Ltd. Podulkur in Nellore district (A.P.). Twenty fields of plant crop of variety Co. 7805 were randomly selected in each factory zone and 500 millable canes were observed from each field. Rodent damage was noticed at shoot stage in which shoots were gnawed and half detached from the stools. In erect canes, boat shaped gnawing marks were observed on the 1st to 6th internodes, whereas in the lodged canes all internodes may be damaged. The damaged internal tissues attract saprophytic and pathogenic organism which leads to the fermentation and withering of canes and

* Department of Applied Zoology, Kuvempu University, B. R. Project, Bardravathi.

ultimately, render canes unfit for mill and the sugar recovery is also reduced. The data in Table 1 showed that the Gayatri Sugars zone had lowest incidence (2.40%) and intensity of rodent attack (0.21%) and the KCSF zone recorded highest incidence and intensity of rodent attack (7.81 and 1.33%, respectively). In this zone farmers grow three crop of paddy in a year and two ratoons of sugarcane. In this area over 60 percent canes are lodged providing enough food and safe shelter to the rodents throughout the year resulting in higher damage to the crops.

There are two popular rodent control practices in Nellore district (i) Use of poison bait of zinc phosphide mixed with rice and (ii) Rat basket (Elukalu butta) which is the tribal devise used to kill the rodents.

Table 1. Rodent damage to sugarcane in Nellore district Andhra Pradesh.

Study factory zones	Incidence (%)	Intensity (%)
KCSF Ltd.	7.81	1.33
Empee Sugars Ltd.	4.32	0.38
Gayatri Sugars Ltd.	2.40	0.21

Ecology based rodent management in Australia and Asia

GRANT SINGLETON

CSIRO Sustainable Ecosystems, GPO Box 284 Canberra, ACT, 2601

The Commonwealth Scientific and Industrial Research Organization (CSIRO) Australia has a large and active group of scientists working on rodent biology and management. Our expertise includes population ecology, social and spacing behaviour, rodent systematics, modelling, epidemiology of micro (viral) and macro (helminth) parasites, predator-prey interactions, reproductive physiology, molecular biology and participatory research. Our activities cover Australia, South Asia, Southeast Asia and East Asia.

In Australia, the focus is on the house mouse, *Mus domesticus*. Populations occasionally erupt to cause tens of millions of dollars damage to winter cereals. Our population research has led to the development of a model that has enabled successful forecasting of over the past 4 years of low and high population trajectories up to 6 months in advance. Coupled with this, another area of research has been the development of ecologically based early management actions. In collaboration with other agencies we also conduct multi-disciplinary research on controlling the fertility of mice. Known as immuno-contraception, the research has gone beyond the proof of concept stage and we are currently conducting laboratory studies on potential products.

In South Asia, we link with the UK Natural Resources Institute (NRI) to conduct research on the biology and management of rodent pests in rainfed rice systems. The work has been in progress for 1 year. Here the emphasis is both on pre- and post harvest losses. The pre harvest research is based on our work done in Se Asia over the past 10 years. The post harvest research is based on work done by NRI colleague in Mozambique over the past 4 years.

In Southeast Asia, we have projects in Indonesia, Lao PDR, Myanmar, Philippines and Vietnam. Our involvement ranges from 9 years in lowland irrigated rice agricultural systems in Indonesia, to 4 years in up land rain fed systems in Lao PDR, to just 6 months in lowland rain fed systems in Myanmar. Again there is a strong emphasis on ecologically based rodent management. In East Asia, The research takes a different twist with a focus on the impacts of rodents in grasslands of China.

(Information on our research activities, publications, profile of the peoples involved in our research and recent training courses, are available at our web page: www.cse.csiro.au/communityecology/rodents)

Rodent Ecology and Management Course - A Report

P. NEELANARYANAN

Nehru Memorial College, Puthanampathi, Tiruchirappalli - 621 007

A three week International Course on Rodent Ecology and Management was organized at International Rice Research Institute, Los Banos, Philippines from May 19 to June 6, 2003. IRRI, Los Banos, ATSE Crawford Fund, Australian Center for International Agricultural Research (ACIAR) and Commonwealth Scientific and Industrial Research Organization (CSIRO), Australia jointly sponsored the course. The main objectives of the course were: (i) to minimize rodenticides usage, (ii) to develop methods of rodent pest management consistent with sustainable agriculture and (iii) to have positive impact on living conditions of rural communities through improving their income and health. Dr. G. Singleton, IRRI consultant and leader, CSIRO Sustainable Ecosystems, Canberra, Australia, organized the course. The participants were drawn from Bangladesh; Myanmar; India; Indonesia; Lao-PDR; Cambodia; Papua New Guinea; Philippines; Sudan; Tanzania; Australia and Portugal with one observer from United Kingdom. I participated in the course from India.

During the course various theory lectures delivered by Drs Charles J. Krebs and G. Singleton included, ecological methodologies, population modeling, community ecology, relationship between the diseases and population regulation and biological control of rodents including immuno-contraception. Second and third session covered the topics like, an overview of reproductive anatomy, taxonomy and biogeography of rodents (by Dr. Ken Aplin) and spatial behaviour, yield losses and pest density, lucid Key for rodent species identification and management of mice in Australia (by Dr. Peter R. Brown). Practical exercises on population modeling viz., age structured population projection and rodent population projection were also taken up. Four group projects were allotted to all the participants on rotation basis. The project were on (i) Management of rat in fields; decision analysis and farmers' survey (ii) Radio tracking, line and spool tracking of rice field rodents (iii) Rodent trapping in the forests of Mount Makiling and (iv) Survey of incidence and taxonomy of rodents in an around urban environments. The participants were also instructed to construct a Trap Barrier System (TBS) of 25x25 m size in IRRI farms.

NOTES AND NEWS

- Dr. B.D. Rana, Project Coordinator (Rodent Control) retired from ICAR's service on 31.12.02. Dr. R.S.Tripathi, Senior Scientist, AICRP on Rodent Control resumed the charge of Project Coordinator with effect from January 1, 2003.
- Shri Vipin Chaudhary, Sr. Training Assistant (PP), AICRP on Rodent Control, Jodhpur was awarded Ph.D. degree from J.N. Vyas University, Jodhpur on his thesis entitled "Bioefficacy of difethialone against *Tatera indica* Hardwicke and *Rattus rattus* Linnaeus in arid ecosystem".
- Dr. AMK Mohana Rao, Rodent Specialist, NPPTI, Hyderabad and Dr. (Ms) Neena Singla, Asstt. Professor, AICRP on Rodent Control, Punjab Agricultural University, Ludhiana attended the Second International Conference on 'Rodent Biology and Management' held at Canberra, Australia from Feb. 10-14, 2003.
- Dr. P. Neelananaynan, Lecturer, Nehru Memorial College Puthanampatti Tiruchirappalli attended a three week International Training Course on 'Rodent Ecology and Management' from 19.5.03 to 6.6.03 at IRRI, Los Banos, Philippines.

Contributions for inclusion in the Newsletter may please be forwarded alongwith 1 - 2 good black and white photographs to :

Project Coordinator,
AICRP on Rodent Control,
Central Arid Zone Research Institute,
Jodhpur - 342 003, India

Editorial Board :

Chairman : **Dr. R. S. Tripathi**

Members : **Dr. M. Idris**

Dr. Vipin Choudhary

Central Arid Zone Research Institute, Jodhpur