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CONTENTS

AICRP on Rodent Control
Central Arid Zone Research Institute
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Studies on relationship between incisor width and body weight of *Bandicota bengalensis*

M. ASHOK KUMAR, T. SENTHIL KUMAR,
K. SARAVANAN, S. ARANGANATHAN,
A. NANDARAJ AND R. GOPI
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Prey-predator relationship and utilization of prey species by predators can be studied by food habit analysis of predators. The direct observation is very difficult in many predators' food habit studies. The indirect methods viz. faecal and gut analysis help in understanding such aspects. The gut analysis is not used for all animals especially rare predators and so the analysis of faecal remains can be of great help to study the food habits. Regurgitated pellet analysis is a standard method for the assessment of the diversity and importance of the prey species in the diets of raptors. As we can get only the skeletal remains (such as mandibles, pelvic girdles, hairs etc.) and other chitinous parts of the prey species in the raptor pellets, identification of their prey items requires specific information about the morphological features of the prey. Several authors have studied the morphological features of the mandibles of the five rodent species viz., *Bandicota bengalensis, Millardia meltada, Mus booduga, Rattus rattus, Tatera indica* and their relationship with their body weight. However, the relationship between incisor width and body weight of the rodents have not been studied so far. The present work is an attempt to know the relationship between the incisor width and body weight of the Indian mole rat, *B. bengalensis*.

Regression equations and normal probability curves have been presented in the figures 1&2 for the relationship between upper incisor width and the respective body weight for both sexes of mole rats. The regression between upper incisor and body weight was found to be good fits as they had correlation of r=0.44 (male) and r=0.89 (female).

Interestingly the upper incisor did not show any annulation and colouration among the different categories of bandicoots. From the results, it is obviously inferred that the width of upper incisors might act as an age criteria in mole rats. So the regression fitted on incisor width of *B. bengalensis* may be used with reasonable accuracy for the estimation of body weights. Besides, as such, the study of incisor width should be highly supported for prey biomass studies based on the mandibles.

Fig.1. Normal Probability Plot for relationship between male incisor width and its body weight.

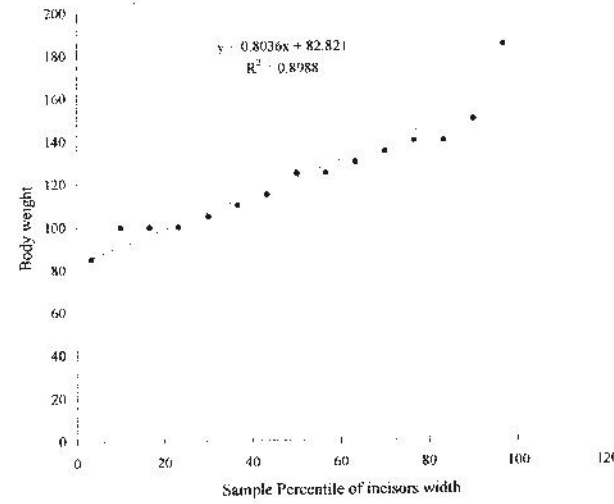
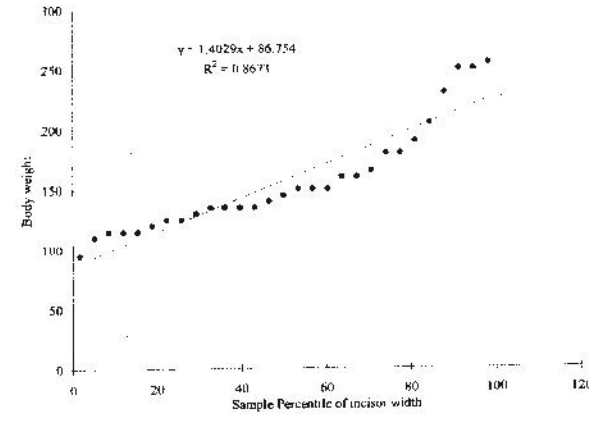


Fig. 2: Normal Probability Plot for relationship between female upper incisor width and its body weight.



Studies on bait preferences of house rats, *Rattus rattus*

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Bait preference tests were conducted with ten adult rats, each being lodged in individual experimental cages. Through no choice experiment, three baits were selected among the 10 candidate baits exposed to every rat for a period of 5 days. The consumption of bait was measured after 24 hours exposure and baits were replaced with a fresh series everyday (Table). Out of the 10 candidate baits, three baits viz, bajra, bengal gram and rice were consumed more by the rats as compared to other baits. Later these baits (grains) were gently roasted and milled. The flour of these grains were mixed in 1:1:1 ratio and added few drops of water to make pellets. This was treated as formulated feed.

Table : Bait preference of candidate foods and their ranking level

Baits (Roasted grains)	Average Daily Intake (ADI) g/100g body wt.)	Percentage of consumption	Rank
Bajra*	11.22 ± 0.05	14.85	1
Barley	06.38 ± 0.06	08.45	8
Beans	05.26 ± 0.07	06.96	10
Bengal gram*	10.26 ± 0.05	13.57	2
Rice*	08.62 ± 0.05	11.41	3
Millet	06.68 ± 0.06	08.84	6
Paddy	06.52 ± 0.09	08.62	7
Ragi	07.24 ± 0.07	09.60	4
Red gram	06.34 ± 0.06	08.40	9
Wheat	07.04 ± 0.05	09.31	5

*Selected bait.

The adult rats, *Rattus rattus* weighed and housed in separate cages, were exposed to the formulated feed and the rate of consumption was measured after 24 hours exposure for five days. The average daily intake of the formulated feed was calculated as 7.1g/100g body weight.

Reports available on bait preferences of different rodent species have indicated great species variation in preferences of their bait. For example the ADI of *R. norvegicus* has been reproted to be 7.68g/100g body wt., however the intake of *R. rattus* in the present study was 7.1g/100g body wt.

Laboratory studies have further shown that in albino rat, *Rattus norvegicus*, when the poison (Zinc phosphide) was mixed with the formulated bait, the consumption of poison bait was more with increased mortality. Hence, formulated feed may be a potential base for making poison bait for the control of house rats.

Potential of carbon disulphide for improving efficacy of rodenticide baiting and trapping of *Rattus rattus*

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Generally, the rats are omnivorous but they are sensitive in their food choice which they determine by socially mediated learning to prefer certain food items more than others in their natural habitat. Olfactory communication about food choice among rats seems to be mediated by combination of cues consisting of odour of food, and semiochemicals emitted by social partners. Carbon disulphide, which occurs in small quantities in the breath of rats and mice, may mediate the socially induced food choices.

This report presents the results of laboratory and field studies determining the potential of carbon disulphide (CDS) in attracting the house rat, *Rattus rattus*, to rodenticide baits and wonder traps. CDS at its three concentrations (0.5%, 1% and 2%) in cereal mixture of wheat, sugar powder and groundnut oil (WSO) in the ratio of 96:2:2 in choice with untreated bait significantly enhanced the acceptance of treated baits by *R. rattus* except with 0.5% concentration against males. Colonies of *R. rattus* each consisting of 5 male and 5 female rats consumed significantly more amount of WSO bait containing 1% CDS. Percent acceptance of colonies ranged from 58-70%. In a 4 day choice feeding test between 1% CDS in WSO and plain WSO bait in special bait containers in poultry houses, *R.rattus* showed more acceptance (56-60%) for bait with 1% CDS, except in one poultry house where both the baits were eaten in equal amounts.

Rodenticide baits containing 2% zinc phosphide, 0.005% bromadiolone and 0.0025% difethialone plus 1% CDS were eaten in more quantity by colonies of 10 *R. rattus* each in pen trials than the rodenticide baits without CDS. Percent acceptance ranged from 66-77% and mortality in these trials was 90-100%. Similarly, the addition of 1% CDS in plain WSO bait in multi-catch traps improved trapping efficacy nearly by 100% as observed in pen trials as well as in 6 different poultry houses.

The results of these studies clearly show that CDS has good potential for improving rodent control programme both with the use of rodenticide baiting and the trapping techniques.

Some observations on infestation of porcupine, *Hystrix indica* Kerr in the forest nursery of arid region

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Indian crested porcupine, *Hystrix indica* Kerr frequently occurs in rocky habitats and inflicts heavy losses to various crops, forest and agro-forestry plantations/trees. It is nocturnal in habit. Girdling and debarking activities of *H. indica* has also been reported from Kangara district in Himachal Pradesh.

During ecological studies of Cutch rock rat, *Cremnomys cutchicus medius* (Thomas) in Aravelli hills near Jodhpur, some gnawed stems of *Euphorbia caducifolia* by porcupine were observed. This bush rocky thorny species contributes about 5% of the total basal cover existing on the rocky out crops of the desert. Only epidermal portion of tender branches were eaten up by porcupines and cambium were left undamaged because of hard tissues. The quills around the caves inhabited by *H. indica* was also collected. A forest nursery situated near the Mandal Nath hill, was also surveyed for rodent collection. In this nursery, mainly the seedlings of Neem, *Azadirachta indica* and *Eucalyptus* sps were attacked by porcupines. Nursery workers reported damage of the 5-6 months old seedlings in both the plants. It is observed that 30% seedlings of neem &12% of *Eucalyptus* sps. were damaged by cutting the young plants, 2"-3" above the ground. Activity of the procupine, *H indica* was also observed in the nursery during the night. This phenomenon was noticed only in the month of May & June when there is general scarcity of food and water in the natural desert habitat. Abiotic factors like extreme heat and non-availability of water influence *H. indica* to cause such a high magnitude of damage in the silva nursery.

Observation on predation of *Tatera indica* by varanids in arid ecosystem

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In nature, predators are beleived to play an important role in population regulation of their preys. Rodents have been reported to be prayed upon by reptiles, large birds, foxes, cats, dogs, etc. Role of Barn owls as a potential and specific predator have been working out in Tamil Nadu. Among the reptiles two species of *Varanus (V. bengalensis and V. griseus)* have been reported to inhabit the Indian arid region. The monitor lizard, *V.bengalensis* has also been observed by us during regular surveys. On several occasions sherman traps laid in the field, when

recollected next morning were found sprunged and the trapped rodents were found charred or in half eaten condition. Such a predation done by *V. bengalensis* was confirmed from the fact that at three occasions we observed this predatory lizard sitting by the unsprunged traps and trying hard to pull out the captured rodent out of it. It's association with field rodents was also noticed, as with every three to four burrow of *Varanus* was seen.Its burrows are shallow, simple with single semi circular large opening. Though its association with any specific rodent was not observed, yet predations of *Tatera indica* in large numbers may show its preference towards this species.

Besides, the monitor lizard was also seen eating dead rodents. It was observed that *Varanus* dug out the dead rodents burried during various experiments near laboratory. At one or two occasasions, *Varanus* even entered into the laboratory and tried to predate upon caged rodent. Most of the time, it was seen roaming out side the laboratory. This may be due to odour of stock of rodents which attracted the varanids.

Such an activity of monitor lizard was mainly seen during monsoon season (from mid of June to September). During this period varanids are seen in large number in varying sizes, probably indicating their breeding seasons.

NOTES AND NEWS

Plague is very difficult to eradicate : Scientists

Plague can re-emerge, vaccination is useless, and mass killing of rats is not a solution for eradication of the disease, according to British scientists who have warned that towns with more than 3,000 rats per square km are potentially vulnerable to plague outbreaks.

Plague eradication is difficult, say M.J. Kelling and C.A. Gilligan of the Cambridge University who have developed a mathematical model for predicting the condition under which plague outbreaks can occur that would help authorities take precautions. Their report is published in a recent issue of the journal *Nature*.

"Plague is primarily a disease of rodents that is spread by fleas and occasionally infect humans,"the scientist says." when the infected rat dies its fleas leave to search for new host rodents. If the density of the rats is low, the fleas are forced to feed on alternative hosts like humans and a human epidemic occurs", their report says.

The scientists have formulated an "animal-based" disease model for the rat and flea population and by coupling this with a standard epidemic human disease model are able to identify epidemic patterns and the circumstances in which

the disease leads to a large number of human cases.

They point out that human vaccination cannot provide a means of eradication as their model shows that plague "is driven by the dynamics of the disease is the rat population." culling of rats may prevent or worsen human epidemics depending on the timing of the cull. if culling is done before the first human case appears, it "may release many infected fleas which may bite humans in the absence of suitable rodent host".

"Given the difficulties in epidemic control, it is important to calculate under what conditions large outbreaks could occur", the scientists said. "There are large reservoirs of plague in wild rural rodents and hence there exists the potential for the disease to enter the highly susceptible urban rat population with clear public health consequences.

Meanwhile. S.Shivaji and his colleagues at the Center for Cellular and Molecular biology said they have established that the disease which caused the Surat outbreak in 1994 was indeed plague. Shivaji said his team examined 18 isolates from sputum samples of Surat victims.

Sequence analysis of their 'ribosomal DNA' and DNA finger printing showed that all the 18 isolates had "99.1 per cent similarity to *Yersinia pestis*, the organism that causes plague," Shivaji said. *(Courtesy: Times of India, New Delhi, Nov. 14, 2000)*

Contributions for inclusion in the Newsletter may please be forwarded along with 1-2 good black & white photographs to

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