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Abundance of Rats and Mice in the selected areas of Dhaka city: a cross sectional study

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ABSTRACT

The study on pattern of abundance and movement of rats and mice was done in two rice godowns; Azad vander and Raj Rice Agencies; of Badamtali, Dhaka. The study was carried out for 8 months, from April to November in the year 2010. The total study area of godown was 5000 sq ft. The area was divided into five blocks. Ten snap traps were placed randomly in the blocks. Traps were placed six times in a month. Total trap placement was 480 and the trapping success was 46.46%. Both the godown stored about 12 kinds of rice and rice was available throughout the year. There were no special preferences observed for any especial kind of rice. Three species of rats and mice were trapped from the study area which were Lesser Bandicoot Rat (*Bandicota bengalensis)*, House Rat *(Rattus rattus)* and House Mouse *(Mus musculus)*. The total number of individual trapped were 223 of which *Bandicota bengalensis* was 79.82%, *Mus musculus* was 13.04% and *Rattus rattus* was 7.17%. Among 223 individuals male was 61.43% and the female was 38.57%. In case of *Bandicota bengalensis* male was 54.49% and female was 45.51%. In case of *Mus musculus* male was 65.52% and female was 34.48%. The sex ratio was 1.59:1. The average litter size in *Bandicota bengalensis* was 5.83, in *Mus musculus* was 5.20 and in *Rattus rattus* was 6.5.

Keywords: Rat, Trap, Abundance, Godown, Seasonal variation, Sex ratio

1. Introduction

Man regarded his rodent companions as little more than house hold pests until the very end of the 18th century. The struggle of man and rat began in earnest and continues to the present day. Then, when the role of the rat in the dissemination of plague first clearly shown, man suddenly realized that the commensal rodents were some of his worst enemies [8]. On the other hand, man providing adequate nourishment and shelter to these creatures in crop fields, godowns, residential premises, thereby helping them in their survival and multiplication. As a result they have become serious pests at almost all stages of food production and residential properties. With the sole exception of man, the most successful and abundant mammals on earth today are the commensal rats and mice [8]. But nothing substantial was done till recently to control the menace. Some of cosmopolitan rats have been studied extensively than any other nonhuman mammals. Nevertheless, as stated by Storer (1962) and quoted by Spillett (1968), "knowledge of the habitats, biology and ecology of alien rodents is still imperfect and better means for reducing their numbers are needed".

The rodents of the Indian sub-continent including Bangladesh have been studied relatively little. The first substantial work was on the biology and ecology of the Lesser Bandicoot Rat *(B. bengalensis)* [1], the commonest rodent in Calcutta and neighboring communities, was done by Spillet during 1964 – 66.

In Bangladesh, the works on rodents include the taxonomic study of rodents by khan (1975, unpublished), the study of rat population of Curzon Hall area by Siddiqui (1975, unpublished), and later on, in 1977 Hussain and Siddiqui published some valuable information on the rat population of a ration shop in Dhaka city [5]. Recently some works has been done in store houses, some fields of rural areas and hilly regions by some NGOs and some researchers. In Asia, pre harvest rice losses are estimated to be between 5 and 10%. A loss of 6% of South East Asia rice production amounts to approximately 36 million [2], i.e. enough to feed the population of Indonesia (215 million people) for 12 months (Singleton, 2003).

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Rodent consumption of stored food and grain and damage to storage structures and containers, and indirect losses caused by spillage, spoilage or contamination that results in condemnation or rejection of shipments is important economic and public health problems worldwide (Jackson 1977, Brooks and La Voie 1990, Conover *et al*. 1995). The great diversity of rodent species, storage structures, and environmental conditions and the difficulty in estimating incremental or indirect losses help mask the economic impact of the problem [15]. Since most rodent species involved in stored product damage are nocturnal, heavy infestations may persist unnoticed without careful inspection of stores or premises (Jackson 1990). In many situations, careful grain handling procedures, indoor and outdoor sanitation, immediate disposal of spillage and garbage, frequent inspection for rodent signs, and maintenance control programs are important ways to prevent the development of more serious and difficult problems.

There are more than 2000 recognized species of rodents [3, 4] (Wilson and Reeder 1993), many of which are described and pictured in Nowak (1999). A relative few of these species, perhaps less than 250 worldwide [3], interact sufficiently with humans to cause economic, conservation, or health concerns sufficient to warrant rodent control efforts.

The present work was designed to collect some more information about the changes in abundance of rats in rice storehouses. Here priority has been given to estimating the seasonal changes in abundance of rats and mice available in storehouses, abundance of different species, physical feature, sex ratio and litter size. During study period, two species of rats and one species of mouse were found. House Rat (*Rattus rattus*), Lesser Bandicoot Rat (*Bandicota bengalensis*) and House Mouse (*Mus musculus)* were mainly trapped.

2. Materials and methods
2.1. Study area
A study on the abundance of rats and mice in rice godown and adjacent area was carried out during the period from April to November, 2010 A. D. at two adjacent rice godowns, Azad vander and Raj Rice Agency, 15/1 Badamtoli, Dhaka. The total core area was 5000 sq ft. and adjacent open areas to the godowns was about

2000 sq. ft. Badamtali area is famous for biggest rice godowns in the city. It looks like a cluster of godowns with about hundreds of different size godowns. The godowns were very nearer to each other somewhat like shops in a market. For better result the study area was subdivided into five blocks. Each of the blocks was equal in size. An effort was made to set a constant number of traps in the godown, although few traps were lost but those were replaced soon after.

2.2. Snap trapping
Ten snap traps were used for eight months. Each trap measured 11.75in × 10.57in × 7.42in. Traps were placed and collected six times in a month. Traps were placed both in transect method and in random method. In transect method the selected plot was divided into five transect. In random method, the traps were placed randomly where burrows were seen available.

Kill traps were placed at night and were collected in the next morning. After collecting the rats and mice, they were counted, classified, measured, aged and sexed. The collected rats and mice were divided as regard to rodent genera, species, then as regard to the number, age and sex. Rats were later dissected to determine their breeding condition and maturity. The sex, breeding condition, age, and trap location of each rat caught was recorded. Age was determined by dissection and males were classified as adult if they had visible tubules in the cauda epididymus and females as adult if they were pregnant or had scars on the uterus. Their weight, total length, head-body length, tail length, forelimb length, hind limb length, ear length, sex, number of embryos (after dissecting female rats and mice) were noted.

3. Result
Seasonal variation in abundance of rats was marked by the difference in trap success in different season. The trapped rats and mice population in store house was 28 in April, 26 in May, 29 in June, 25 in July, 24 in August, 28 in September, 30 in October and 33 in November. Total 223 rats and mice were trapped. Trapped species included 79.82% Lesser Bandicoot Rat *(Bandicota bengalensis)*, 7.17% House rat *(Rattus rattus)* and 13.04% House Mouse *(Mus musculus)* (Table 1).

Table 1: Percentage of three species of rats and mice trapped in rice godown.

Species	Total trapped from each species	Total trapped individual	Percentage of species
B. bengalensis	178		79.82%
Mus musculus	29	223	13.04%
Rattus rattus	16		7.17%

The majority of the trapped rat was Lesser Bandicoot Rat (*Bandicota bengalensis*). All of the rats and mice were found dead in kill traps. The trap success in April was 46.67%, in May was 43.33%, in June was 48.33%, in July was 41.67%, in August was 40%, in September was 46.67%, in October was 50% and in November was 55%.
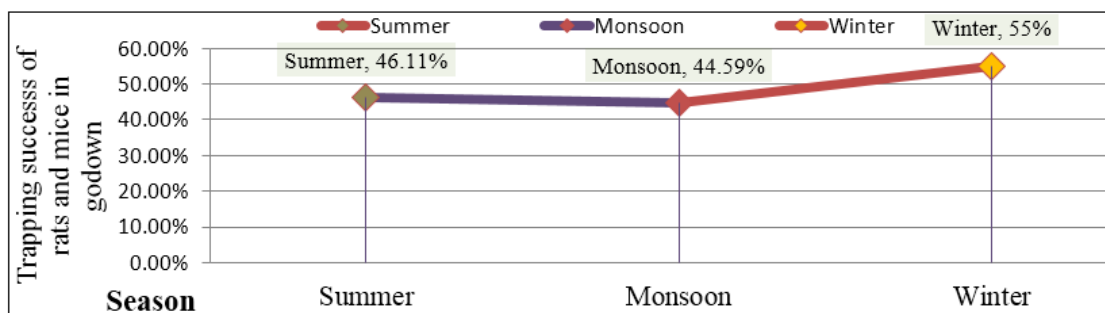

Fig1: Seasonal Variation of trapping success in rice godown

The total trap success was 46.46%. No multiple catches were seen. Seasonal fluctuation is clearly visible from this study. The trapped population was highest in the month of November and the second highest was in the month of October. The lower number of rat was trapped in the months of May, July and August and it was continued till the September. The lowest number of rat was trapped in the month of August. The second lowest was in the month of July. From April to June the average trap success was 46.11%. So in summer the average trap success was 46.11%. From July to October that means in monsoon the average trap success was 44.59%. Early winter was represented only by the month of November. In early winter the average trap success was 55%. The average number of trapped rats and mice was 27.67 in summer, 26.75 in monsoon and 33 in early winter (Fig 1).

For physical information, after trapping by kill traps, the individuals were measured, taken weight and classified according to their gender. If female, then it was dissected to find out the embryos.

Eighty two percent of the 223 rats aged were adult. This high percentage of adult rats probably because the trapping was done only at night and the adults were more trappable than juvenile at night. In godown, male and female both sexes were trapped. In case of Lesser Bandicoot Rat, the percentage of females never exceeded that for males except in July. The total percentage of male and female was 61.43 and 38.57 respectively. In case of House Mouse, the percentage of female never exceeded the percentage of male except in April and September when the male female number was equal. The total percentage of male and female was 54.49 and 45.51 respectively in case of House Mouse. In case of House Rat only a single female was trapped in September. The total percentage of male and female was 65.52 and 34.48 respectively in case of House Rat. Of total 223 individual trapped, the sex ratio of the rats caught was 137 males; 86 females and showed no seasonal continuity over the eight month period. The sex ratio between male and female was 1.59:1. Among 137 male 89.05% male were adult and among 86 female 70.93% female were adult. Among 61 adult female 65.57% female were pregnant.

In godown, 86 females were trapped. Among them 75 were *Bandicota bengalensis*, 10 were *Mus musculus* and only one were *Rattus rattus*. In *Bandicota bengalensis* lowest litter size was 5 and highest were 10. Of total 75 *B. bengalensis* 34 pregnant female contained 199 embryos. The average litter size in *B. bengalensis* was 5.83. In *Mus musculus*, lowest litter size was 4 and highest litter size was 8. The average litter size in *M. musculus* was 5.20. The only female *Rattus rattus* found in godown contained 8 embryos. The average litter size among the pregnant females was 6.34.

4. Discussion

Though the study was carried out in two adjacent godown which were 5000 sq. ft. in size but the locality contained about 100 more similar godowns. The godowns were situated very close to each other. So immigration and emigration was possible though the store houses were surrounded with semi-brick walls. But immigration and emigration was negligible because all the store houses constantly stored a specific amount of rice throughout the year. It is considered that there was no special preference for any especial godown. So it is unlikely that the immigration and emigration influenced our results.

Significantly more adult rats were caught during the whole experiment period than the young, indicating that adults were more

trappable on an average than young. The seasonal variation in trap success was obtained in this study without making or imposing any changes to the study area and physical structure. The trap success was highest in early winter and lowest in fall. The high rate of average trap success indicates high population density. The calibration may not be as accurate at other places and times because of habitat and seasonal influences on home ranges and behavior. Parvin Sultana and Michael M. Jaeger (1992) suggested a regular annual cycle in the numbers of bandicoot rats in the rice/wheat growing areas of Bangladesh [6, 7]. They observed that populations are highest in November- December, coincident with the main rain-fed crop (aman rice), and lowest from the end of the dry-season (May-June) until recession of flood waters in September and October.

The dissected females with average litter size of 6.34 shows the high rate of birth. This probably due to available food supply, favorable weather and suitable shelter throughout the year.

Bandicota bengalensis is highly fossorial [9] and many burrows were found on the floor and a few outside the study area 10-15 ft away. As the rice godowns were not sufficiently protected from rats, burrows were available inside the godown. Sometimes they made whole in the wall and concrete floor. Huge amount of burrows were seen in the back side of the godown. Plenty of foods were available in almost every month in the godown but the higher food storage was in the month of August to November. The studied storehouses constantly possessed 2400 mounds of rice or more but not less than that.

The sex ratio between male and female was 1.59:1. A slight excess of males in trapped samples of small mammals generally is taken to indicate equal sex ratios in wild populations (Jackson, in store, 1962). Parrack (1967) also observed that dominant male Lesser Bandicoot Rats are more active than females and subordinate males. Hence, males, particularly dominant ones, normally would be susceptible to trapping than females. Among 178 *B. bengalensis* 57.87% were males. The reason is not understood why *B. bengalensis* sex ratio obtained during this study varied significantly from those of most investigators in India and Bangladesh except Spillet (1968) who had found 61% of the Lesser Bandicoot Rats trapped in 3 out of 4 godowns were males [1].

The eye of rat is specialized for nocturnal habit. The activities of rats were observed just after the dusk. So, the traps for seizing them were placed before the dusk. So, most of the traps were engaged before the dusk. However, a few rats fell into the traps at day in some insufficiently illuminated parts of the rice godown. It is apparent from above observation that though the rats were very active at night, their activities by day times were also noticeable, however, a lesser degree.

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