Dietary Study on *Rattus rattus* Complex in Dayaebo Village in Hlegu Township, Yangon Region

Nilar Soe[1] and Sa Soe Shwe[2]

Abstract

Dietary study on *Rattus rattus* complex was carried out in Dayaebo village in Hlegu Township, Yangon Region. The study period was from May, 2004 to April, 2006. Five habitats (inside house, around grain stores, in village gardens, under houses and near livestock) were selected in the study village to set up the traps. Habitats, sexes and breeding condition of each collected rat were also recorded. Five major food items were identified within the stomach contents as rice grain, vegetables, insects, plant materials and miscellaneous items. During the study period, rice grain and miscellaneous items were dominant food items. The highest consumption of rice grain by *R. rattus* occurred in the hot and cold seasons. The lowest consumption of this food items occurred in the rainy season. Throughout all seasons, no significant differences were observed in the consumption of all food items in *R. rattus*. No significant differences were observed in the consumption of five food items between males and females. Feeding of rice grain by breeding and non-breeding females differed significantly. Significant differences were observed in the consumption of food items among the different habitats.

Key words*: Rattus rattus*, food items, habitats, Dayaebo village , Hlegu Township

Introduction

Rodents form a dominant group of mammals, in fact, 42 percent of all the mammal species on earth are rodents. There are more than 2700 species of rodents (Aplin *et al.,* 2003). All the major pest of rodent species classified under the family Muridae in South and Southeast Asia belong to only a handful of genera, among which were Rattus, Bandicota and Mus (Aplin *et al*., 2003). Rodents occupy a wide range of natural habitats, including forests and grasslands, as well as the human world of agricultural landscapes, villages and townships (Aplin *et al.,* 2003). Indeed in almost all societies, the rodent species found around houses and in field are viewed as pests or even as vermin (Aplin *et al*., 2003). Rodents affect rural families in the three main ways: they eat agricultural crops in the fields; they eat, spoil and contaminate stored food; and they carry diseases of humans and their livestock (Aplin *et al.,* 2003). Damage to stored food is usually caused only by the three commensal species, the Norway rat, roof rat and house rat (Greaves, 1989).

Myanmar is an agricultural country, and rice, maize, oilseed, sugarcane, and pulses are the main crops. 53 % of rice is grown under rainfed conditions (Singleton, 2003). Diets are extremely significant for determining evolution, life history strategies and ecological roles of animals. Food is one of the most important dimensions of the niche and therefore, information on diets of animals is virtually a prerequisite for most ecological research (Krebs, 1999). Rodents are the carries of human diseases such as the plague, rat–borne typhus, hantaviruses, leptospirosis, tularaemia, rickettiosis, and arenaviruses (Gratz, 1994). The focus of present research is directed towards gaining better understanding of how rodent population in the village habitat survived by utilizing available food source. Management of pest species should be improved by integrated methods and predictive models, to make a good decision about where and when control is to be directed.

Objectives of the study

The present research is carried out with the following objectives:

- To assess the *R. rattus* and its major food item within the village ecosystem.

[1] Assistant Lecturer, Dr., Department of Zoology, Hinthada University
[2] Assistant Lecturer, Dr., Department of Zoology, Hinthada University

- To investigate whether there are any differences in the diet of *R. rattus* between seasons and sexes.
- To determine the consumption rate of breeding and non-breeding female.
- To investigate the diet of *R. rattus* in different habitats of village ecosystem.

Materials and Method

Study site and period

This study was conducted in Dayaebo village in Hlegu Township (17° 7′ 53″ N, 96° 15′ 25″ E) (31 m altitude). Dayaebo village is 706 hectares (7.06 m^2) with 428 houses providing 468 families with a population of 2081, including 173 farmers growing mainly rice (Figure 1). This study was conducted from May, 2004 to April, 2006.

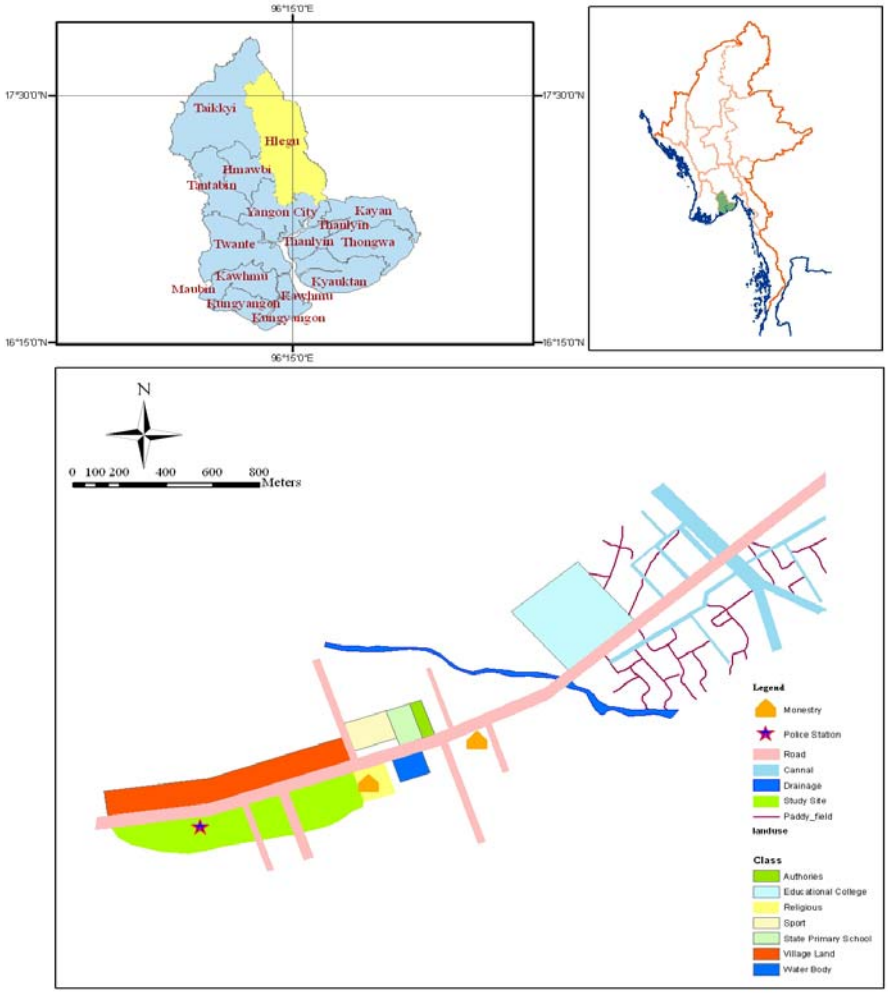
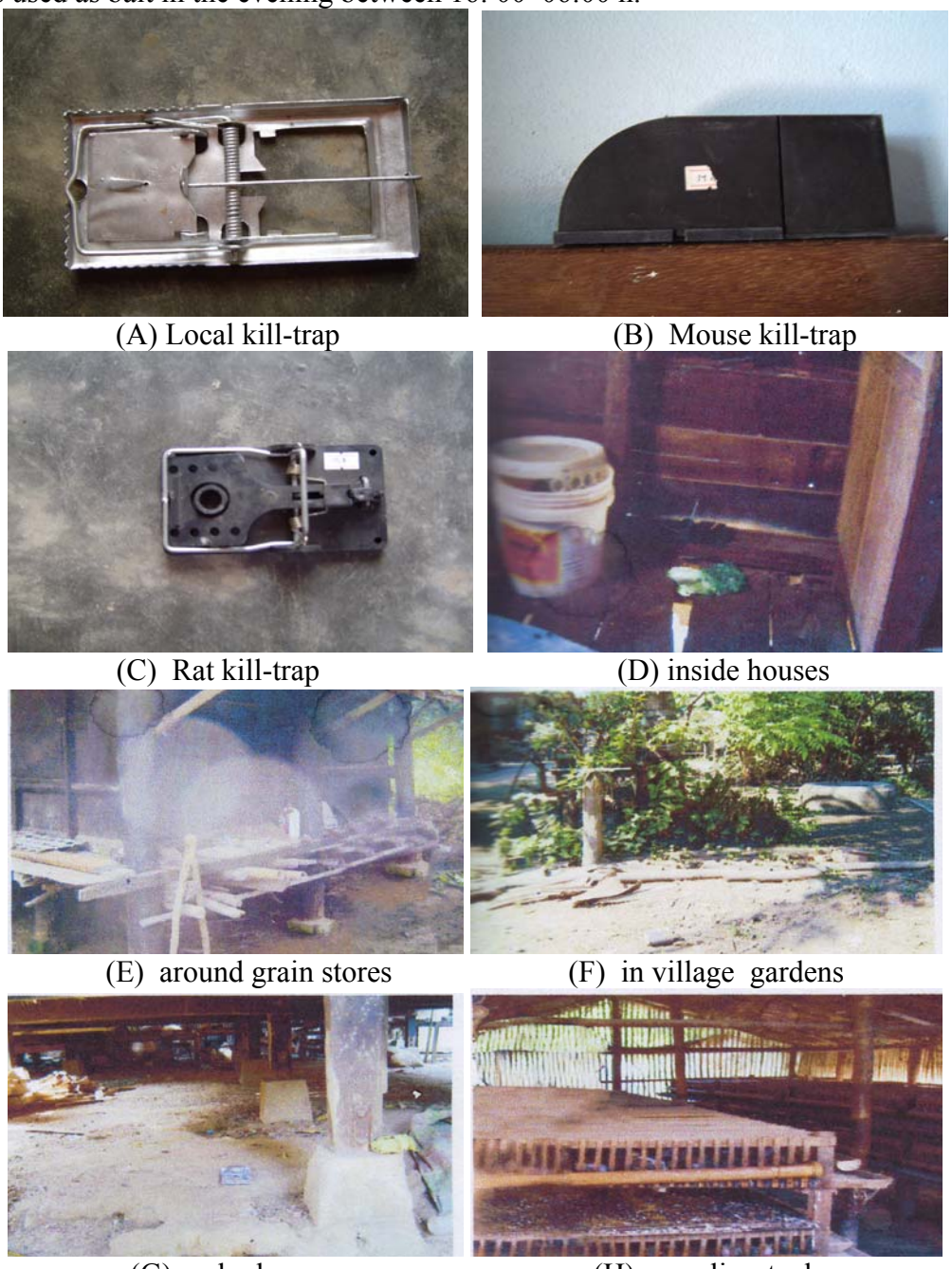


Figure 1. Study area of Dayaebo village, Hlegu Township
Source: Forest Department (Scale- 1:500000)

Trapping procedures

Five houses were selected randomly at the study site. Trapping was conducted for four consecutive nights per month. Three types of traps were used; namely, local kill trap, mouse kill trap and rat kill trap. Traps were set at five different places such as (a) inside houses, (b) around grain stores, (c) in village gardens, (d) under houses and (e) near livestock (Figure 2).

A total of 75 traps (25 of each type) were used in this study. 5 traps of each type (n= 15) were set each night in each habitat. Traps were set at a distance of 7 m from each other. Dry fish was used as bait in the evening between 16: 00–06:00 h.



(A) Local kill-trap (B) Mouse kill-trap

(C) Rat kill-trap (D) inside houses

(E) around grain stores (F) in village gardens

(G) under houses (H) near livestock

Figure 2. Various types of traps and habitats

Specimen collection

Specimens were collected in the morning. The collected specimens were labeled, identified, sexed and weighed (Figure 3). The habitat and breeding condition of the specimen were also recorded. The specimens were dissected; stomachs were removed and preserved in 70 % ethanol until the contents were examined.

(A) Sexing (B) Weighing of specimen (C) Measuring of specimen

Figure 3. Sexing, weighing and measuring of the specimens.

Stomach content analysis

The stomachs were opened and the contents were rinsed in 90 % ethanol and washed thoroughly on a sieve (0.5 mm aperture). Identification of the food particles was done under dissecting stereo microscope. Dietary items were identified by direct comparisons with previously prepared reference slides.

Preparation of reference slides

Rats were trapped alive and kept for 12 hours without food. The specific food item to be prepared as reference slide was fed for two days. The rat was scarified and the stomach was removed. The food contents were washed in 90 % ethanol and collected. The cleaned fragments were air dried thoroughly and spread on a slide. Permanent slide was made by using Canada balsam and cover slip check.

Percentage of estimation

Estimation of the percentage for each food item was conducted with standard square grid lines (2.5 mm^2) at 10 magnifications under a dissecting stereo microscope. Percentage volume score for individual dietary item was calculated according to the method stated by Tobin *et al.* (1994).

$$\text{Percentage of estimation} = \frac{\text{(Number of squares in which a food item occurred)}}{\Sigma\ \text{(Number of squares occupied by individual items)}} 100$$

Results

Systematic position

Phylum	– Chordata
Subphylum	– Gnathostomata
Class	– Mammalia
Subclass	– Theria
Infraclass	– Eutheria
Order	– Rodentia
Family	– Muridae
Genus	– *Rattus*
Species	– *Rattus rattus* Complex
Common names	– House rat, Black rat, Roof rat
Local name	– Kywet Wann Phyu

Seasonal diet of *R. rattus*

In both of the study period in Dayaebo village, rice grain composed as the main diet of *R. rattus* in the hot, rainy and cold seasons. Miscellaneous items were next dominant food item followed by vegetables. Throughout all seasons, the consumption of insects and plant materials were very scarce. The highest consumption of rice grain was observed during the hot and cold seasons. No significant differences were found in the consumption of all five food items among seasons (Figure 4, Table 1).

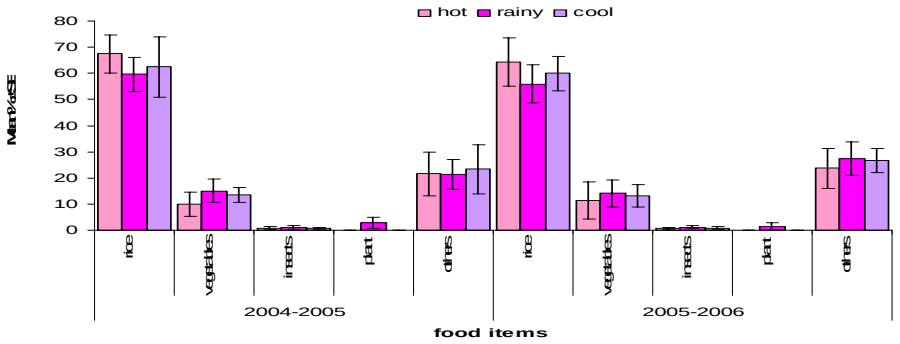
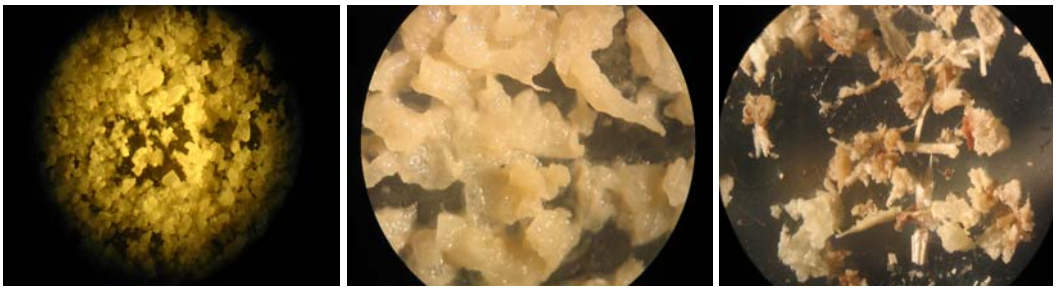


Figure 4. Seasonal diet (Mean% ± SE) of *R. rattus* in Dayaebo village

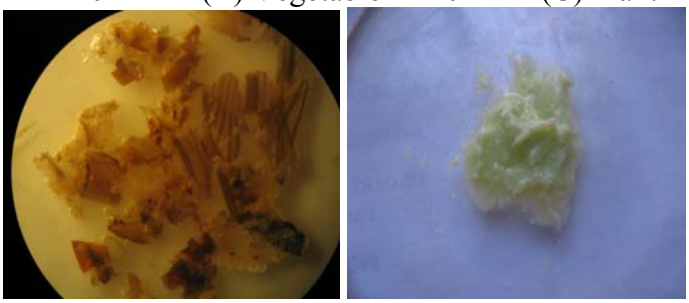
Table 1. Seasonal diet (Mean% ± SE) of *R. rattus* in Dayaebo village

Food category	hot		rainy		cold		'F' value	'p' value
	2004-2005 (n = 8)	2005-2006 (n = 7)	2004-2005 (n = 14)	2005-2006 (n = 14)	2004-2005 (n = 8)	2005-2006 (n = 12)		
Rice	67.5±7.27	64.28±9.3	59.6±6.68	55.92±7.37	62.51±1.49	60±6.52	0.4376	0.6476
Vegetable	10±4.54	11.42±7.06	15±4.41	14.07±5.06	13.5±2.82	13.06±4.26	0.2806	0.7563
Insects	0.87±0.64	0.57±0.36	1.07±0.69	1.21±0.5	0.62±0.42	0.83±0.47	0.5727	0.5671
Plant	0	0	2.85±2.01	1.42±1.42	0	0	1.9108	0.1569
Miscellaneous	21.62±8.4	23.71±7.67	21.42±5.69	27.35±6.28	23.37±9.36	26.66±4.58	0.0455	0.9555

Food contents



(A) Rice grain X 10 (B) Vegetable X 10 (C) Plant materials X 10



(D) Insect X 10 (E) Miscellaneous items X 10

Figure 4. Diets resulted from stomach analysis

Dietary composition of male and female

No significant differences were found in the consumption of five food items between male and female (Table 2).

Table 2. Comparison of five foods (Mean% ± SE) between male and female *R. rattus* in Dayaebo village

Food category	2004-2005		2005-2006		't' value	'p' value
	Male (n=13)	Female (n=17)	Male (n=11)	Female (n=22)		
Rice grain	61.15±9.83	65.53±5.35	57.72±8.94	60.81±6.10	-0.2675	0.7900
Vegetable	11.92±4.67	14.58±8.69	10.63±5.04	14.09±3.87	-0.8100	0.4211
Insect	0.76±0.44	1.0±0.37	0.72±0.03	1.18±0.38	-0.8950	0.3743
Plant	3.07±2.16	0.00	1.81±1.81	0.00	2.2692	0.0898
Miscellaneous	23.46±2.17	23.88±5.04	29.18±6.77	24.0±4.02	0.5174	0.5699

Comparison of the diet between breeding and non–breeding female *R. rattus*

Significantly higher consumption of rice grain ($t = 5.7012$, $p<0.01$) but lower consumption of vegetables ($t = 2.7431$, $p< 0.05$) and miscellaneous items ($t = 2.5647$, $p<0.050$) were also observed in breeding female than in non-breeding females. The consumption of rice grain in breeding females was significantly higher than non- breeding females. This finding is assumed to be associated with the peak of the breeding period at the onset of monsoon although breeding females were found throughout the year. The stomach contents also show small amount of insects. The insects are likely to be taken in together with rice grain and other food categories. Miscellaneous items of food in *R. rattus* include waste food from kitchen, soap, plastic, residue of animal food from livestock such as quail, pig, fowls and many unknown items. This factor is assumed to be associated with abundance and availability in the village. Throughout all seasons, rice grain consumption of *R. rattus* was highest around grain store. This finding is assumed to be associated with the habitats. In all seasons, as this species mainly inhabit around grain stores, where the food source is always available (Table 3).

Table 3. The diet (Mean% ± SE) of breeding and non-breeding female *R. rattus* in Dayaebo village

Food Category	Breeding (n=20)	Non breeding (n=19)	't' value	'p' value
Rice grain	77.00±3.79	45.16±5.13	-5.0246	0.000**
Vegetable	11.25±3.40	17.89±3.98	1.2727	0.2111
Insect	0.80±0.38	1.37±0.39	1.0404	0.3049
Plant	0.00	0.00	-	-
Miscellaneous	10.95±2.80	17.29±3.96	5.1085	0.000**

** $p<0.01$

Seasonal habitat and diet preferences of *R. rattus*

Among the three seasons, significantly higher consumption of rice grain ($F=2.7$, $p<0.05$) occurred around grain stores. The consumption of vegetables was significantly higher ($F= 7.9035$, $p<0.01$) inside houses. No significant differences occurred in the consumption of miscellaneous items between habitats. Significant differences were not observed in the consumption of insects between habitats. Significant differences was found in

the consumption of plant materials (F= 3.0515, p< 0.05) near livestock habitats (Table 4, 5 and 6).

Table 4. Diet (Mean±SE) of *R. rattus* in different habitats of Dayaebo village in the hot season during 2004-2006

Food category	Inside houses (n=5)	Around grain store (n=11)	In village garden (n=2)	Under houses (n=2)	Near livestock (n=0)
Rice grain	46.00±9.88	17.90±8.15	55.00±5.05	60.00±10.10	-
Vegetables	25.40±7.71	5.45±2.82	10.00±10.00	29.00±1.00	-
Insects	1.60±0.68	0.30±0.30	2.50±2.5	1.00±1.00	-
Plant	-	-	-	-	-
Miscellaneous	27.00±5.64	23.36±6.90	32.50±7.57	10.00±10.00	-

Table 5. Diet (Mean±SE) of *R. rattus* in different habitats of Dayaebo village in the rainy season during 2004-2006

Food category	Inside houses (n=9)	Around grain store (n=14)	In village garden (n=1)	Under houses (n=2)	Near livestock (n=2)
Rice grain	54.22±9.46	66.42±7.82	30.00	50.00±8.17	35.00±35.00
Vegetables	25.55±7.47	8.35±3.19	10.00	25.00±5.05	0
Insects	1.11±0.61	0.71±0.32	0.00	2.50±2.50	1.00±1.00
Plant	0	1.78±1.78	15.00	0.00	10.00±10.00
Miscellaneous	22.77±6.62	22.71±5.98	45.00	22.50±22.50	55.00±25.25

Table 6. Diet (Mean±SE) of *R. rattus* in different habitats of Dayaebo village in the cool season during 2004-2006

Food category	Inside houses (n=5)	Around grain store (n=11)	In village garden (n=2)	Under houses (n=2)	Near livestock (n=0)
Rice grain	46.00±9.88	70.90±8.15	55.00±5.05	60.00±10.10	-
Vegetables	25.40±7.71	5.45±2.82	10.00±10.00	29.00±1.00	-
Insects	1.60±0.68	0.30±0.3	2.50±2.5	1.00±1.00	-
Plant	-	-	-	-	-
Miscellaneous	27.00±5.64	23.36±6.90	32.50±7.57	10.00±10.00	-

Discussion and Conclusion

The higher rice grain consumption of *R. rattus* was found in the hot and cold seasons. This finding is assumed to be associated with the full storage of paddy in the barn in village in this season. Feeding rate of male and female was found to be similar in village. This factor is assumed to be associated with the environmental conditions since both sexes have the same opportunities in the changing conditions in their respective environments. *Rattus rattus* consumed vegetable from inside houses and under houses – vegetables were rarely grown around houses. These vegetables are likely to be taken from kitchen and small shops which are located inside the houses. Throughout the year, dumped waste materials were most commonly found near livestock and in village gardens and thus the diet of rats living in these places contained assorted items as food. In *R. rattus*, rice grain was found to be a major food

item; however a considerable amount of other categories shift in proportion. The dietary strategies of this species are more similar to those of omnivores feeding mainly on all available food stuff from the kitchen and residue of animal food. The items of food taken by rats were usually related to the food that resent in close vicinity of rats. It could be assumed that rats basically foraged near their nests.

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