CHAPTER - VI
1. Introduction

The Indian gerbil, Tatera indica (Hardwicke), is widely distributed, from Iran to India and Sri Lanka; though of the single species, several geographical races are recognised (Prater, 1965; Barnett and Prakash, 1975). It is also a pest of food crops, which are exploited at all stages of growth. Harvest time is, however, the season of plenty, when large amounts of grains are hoarded by it in the burrows (Prasad, 1954; Prater, 1965).

Their hoarding behaviour has considerable economic importance (Barnett and Prakash, 1975); but it has not been systematically studied. We observed the male Indian gerbil, Tatera indica indica, hoarding a familiar cereal food, or wheat, after receiving exclusive diet of vegetables for a week. The results of these experiments are discussed here.

2. Material and Methods

2.1. Subjects: The subjects were wild-caught stock, maintained on rat diet and ad lib water. Juveniles and pregnant females
were excluded. Of those selected, each occupied a wire-mesh enclosure, 1.32 x 1.0 x 0.32 m; provided with wooden nest-boxes, 30 x 30 x 30 cm, on one side and food and water trays, about 0.75 m away, at the opposite ends of the cage. 4 males (Mean body-weight = 194.25 ± S.E. 11.75 g; range: 175-225 g) and 4 females (Mean wt. = 149.0 ± S.E. 15.0; range: 127-170 g) were included in the experimental group; and only 2 males (wts. = 150 and 172 g) and 2 females (131 and 162 g) in the control group. Replicates were run simultaneously.

2.2. Experimental Procedure: Wheat (*Triticum aestivum* Linn.) was given to controls without change; but experimental gerbils were fed on (i) wheat for 7 days (ii) and in continuation, on vegetables for another 7 days, (iii) and then on wheat again. Of the four vegetables - brinjal (*Solanum melongena* Linn.), potato (*Solanum tuberosum* Linn.), calabash (*Legenaria siceraria* (Mol.) Stadl.) and pumpkin (*Maxima cucurbita* Duch.), each kind was given to one gerbil of either sex.

Body-weights were taken at the end of I and II phases of expts, but on alternate days in the last or III phase when wheat was offered for the second time. Cages were checked daily; and grains hoarded, if any, were recovered and weighed separately. Food consumption was also measured, of vegetables on the basis of oven-dried weights. Energy value of foods given was read from
Aykroyd's Manual (1963); and methods described by Bailey (1959) were followed for statistical analysis.

3. Results

Details about the choice and consumption of food will be given elsewhere. Changes observed in body-weight of male gerbils when fed successively on wheat, vegetables and wheat, and the amount of wheat hoarded by them in the last phase of experiments are, however, plotted in Fig.12.

Body-weight of gerbils was affected by difference in energy value of foods offered, 3.46 cal/g in wheat compared to 0.12 to 0.97 cal/g in vegetables (Aykroyd, 1963). The 'calorie deficit' on vegetable diets resulted in significant weight losses (paired 't' tests, P < 0.05) or 'nutritional depletion' of experimental gerbils, for no changes were observed in weight of controls simultaneously receiving wheat.

On the same choices in vegetables, however, the males lost more weight than females ('t' tests, P < 0.05), viz. 14.3% on calabash, 11.3% on pumpkin, 10.2% on potato and 4.5% on brinjal, compared to respectively, 10.6%, 8.2%, 8.1% and 3.4% reductions noticed in female body-weights. The loss was, however, recovered on access to wheat again (Fig.12).
Changes in body weight and hoarding scores of male gerbils. Females of the experimental group also lost weight, but did not 'hoard' any food.
Fig. 12
Of wheat offered again in place of vegetables, variable amounts were hoarded by the male gerbils in their nest-boxes. 125 to 350 g was recovered on the first day, but larger amounts on the following days (Fig. 12). Maximum amounts were stored between 3rd to 6th day, when hoarding was gradually reduced and stopped abruptly by two of the four males. However, 1.918 to 2.593 kg wheat was hoarded in 7 to 10 days that the behaviour persisted.

Hoarding scores showed an inverse relation to the increase in body-weight of male gerbils (correlation test, $P < 0.05$) except in case of one fed earlier on brinjal ($r = 0.66$, $P < 0.05$). Although similarly reduced in weight, experimental female gerbils, much like the controls of both sexes, did not hoard wheat.

**Discussion**

Food hoarding by rodents is a complex activity (Barnett, 1975); even though it may easily be provoked by varying degrees of food deprivation (McCarty and Southwick, 1974). Sex differences have thus been observed in most such experiments with laboratory rat (Morgan, et al., 1943; Herberg, et al., 1972), hamster (Smith and Ross, 1950b) and Mongolian gerbil (Nyby, et al., 1973); for the females consistently hoard more than males.
Apparently, sex differences in hoarding behaviour indicate a division of labour that may have evolved to balance the needs of food acquisition. Female hoarding thus provides energy for care and nourishment of young; and is largely influenced by hormonal changes underlying maternal activity (Herberg, et al., 1972; Nyby, et al., 1973). That high quality of maternal care is provided, becomes obvious from the high rates of hoarding that occur with them.

Hoarding activity of males serves a different function, of obtaining reserve food supplies. It's adaptive value increases, therefore, with social organisation. In the highly gregarious Mongolian gerbil, as in other rodents living in temperate climate, it is timed by decline in gonadal function at the termination of breeding season, and ensures sufficient stores of food for overwinter survival (Rice and Terman, 1972; Nyby, et al., 1973).

Nutritional factors also supply the drive for the behaviour exhibited by male laboratory rats (Smith and Powell, 1955). It depends, however, on a hypothalamic mechanism, which is activated by long term 'calorie need' (Herberg and Blundell, 1970). It would appear that a similar mechanism controls hoarding in male T. i. indica. It continues for as long as they remain 'nutritionally depleted', or undernourished. Changes in body-weight also govern the response; which follow an inverted bell-shaped function (Fig. 12). Female gerbils are not affected; for some preliminary observations show
that it depends on pregnancy.

It is obvious from the above that hoarding behaviour of male gerbils in the natural environment, would coincide with periods of 'food scarcity', which continually arise for example with rotation of crops in the field or with change in seasons. However, more experiments will be needed to clarify whether it is also influenced at harvest time by food deficit or hunger.

Summary

In laboratory enclosures, male *Tatera indica indica* 'hoard' a cereal, or wheat, for as long as the weight lost on previous diet of vegetables is not recovered. The female gerbils exhibit no such response.