The female reproductive cycle in mammals is actually a multiplicity of interlocking cycles in which the rhythmic interplay between the hypophysis and the ovary is fundamental. A detailed study of the ovary and of the neuroendocrine mechanisms are of prime importance to realise the hypophysis and the ovary as a functional system.

The rodents comprise a large number of species which differ widely in their reproductive pattern and relatively very little information is available about their reproductive pattern (Asdell, 1964), except in some of the laboratory species like rat, mouse, hamster and guinea pig. Some rodents such as field vole (Clarke and Forsyth, 1964) and mice (Harris, 1979) are polyoestrous and in the unmated state experience a succession of estrous cycles over a considerable period of the year. Other rodents such as squirrels (Mc Keever, 1966; Seth and Prasad, 1969) have a very restricted breeding season during which the females may undergo only a few sexual cycles. The common laboratory species mentioned above are all polyoestrous reproducing at all times of the year. Morphological studies on which much laboratory rodent reproductive physiology is based (Mossman, 1966), indicate that most of the differences between the various rodents are of degree rather than kind and the plea for morphological investigation of further rodent species of the very large and diverse group has been generally ignored.

Definitive information on the morphology of the ovary is available on less than 10% of the 230 recognized genera of sciurid and murid rodents. Existing comparative account indicates that marked differences occur with respect to various ovarian elements. Until more knowledge accumulates on the reproductive biology for more mammalian genera, drawing conclusions will be risky (Duke, 1980).
Recent studies on rodents have been ultrastructural, histochemical and endocrinological and have been exhaustive on a few common laboratory rodents such as rat, mouse, and guinea pig which cannot be considered as typically mammalian since reproductive process varies from species to species. Realization of the narrow foundations of our knowledge has led during recent years to an increasing interest in the comparative aspects of reproduction in mammals.

The studies in the wild species have been limited to the field observations, their breeding pattern but no details have been studied regarding either the female reproductive tract and its physiology or the role of the pituitary and the endocrinological aspects. After reviewing the literature, it was thought that a study of the reproductive phenomena of the gerbil, *Tatera indica* Cuvieri, a member of the family, Cricetidae and sub-family, Gerbillinae, about which very little is known (Allonson, 1970) would besides filling the lacunae in our knowledge about this group of rodents would be of some economic importance as the gerbils cause much damage to the agricultural crops. It is a nocturnal rodent adapted for the burrowing mode of life and lives in deep burrows around the borders of the dry agricultural fields. Some studies have been dealt with the natural history, food and feeding habits and the reproductive cycle of the female gerbil (Prasad, 1954a, 1954b, 1961). The growth and the reproduction in South African gerbil, *Tatera afra*, from the region of south west and *Tatera brantsi*, from Reef area around Johannesburg, Transvaal have been reported by Measroch (1954). The present investigations deal with the physiology and reproductive pattern in the female South Indian gerbil, *Tatera indica* Cuvieri. It was thought that this knowledge could be used to develop the gerbil as an experimental laboratory animal for medical and physiological research.
The work on the female gerbil embodied in this thesis deals with five aspects of reproductive biology under five different chapters. The general methodology followed in the course of investigation includes histology, histochemistry and biochemical analysis in the normal and in the experimental females. The details of the experimental methodology adopted are described in each of the concerned chapters.

Chapter I deals with the female reproductive cycle of the gerbil and describes the morphological features of the reproductive system starting from the ovarian development in the post-natal phase to the follicular development and histology and histochemistry of follicular stroma. The corpus luteum of pregnancy and the changes in the reproductive tract are also studied. On the experimental side the chapter deals with the effect of gonadotrophins on the ovarian development, the effects of unilateral ovariectomy on the compensatory hypertrophy of the intact ovary and the effects of bilateral ovariectomy on the accessory reproductive organs with and without ovarian steroids replacement.

Chapter II deals with the structure and cytophysiology of the pituitary gland of the female gerbil in relation to its reproductive cycle based on the cell types studied by various staining and cytochemical methods. Immunocytochemical methods for the localization of LH and FSH producing cells in the pituitary glands of the normal female gerbils have also been employed. The experimental females include ovariectomized and treated gerbils.

Chapter III examines the structure and function of the pineal gland of the gerbil in relation to reproductive cycle. The post-natal development of the pineal gland and its response to the altered laboratory conditions of total light and total darkness are the main features dealt under this chapter.
Chapter IV deals with the cytophysiology of the adrenal glands of the gerbils in relation to the reproductive cycle. The post-natal development and the seasonal changes in the adrenal glands of the female gerbil are described together with the observation of the presence of 'X' zone in the adrenal cortex. The effect of metopirone on the histology of the adrenal cortex is followed further to correlate with the changes induced in the pituitary gland (Chapter II).

Chapter V deals with some of the biochemical parameters in the female reproductive tract in relation to the reproductive cycle both in the normal and in the experimental groups of gerbils involving ovariectomized, estrogen, progesterone and estrogen and progesterone treated groups.

Thus the aim and scope of this present investigation is to fill, though partially, lacunae in our knowledge of the reproductive biology of a wild rodent, the gerbil under the natural and experimental conditions.

The seasonal structural variations noticed in the reproductive organs and the female fertility (the peak of pregnant population) recorded during the different months of the year would be of great value in timing the proper control measures on a large scale for effective rodent control programmes in the agricultural fields.