MATERIALS AND METHODS

House sparrow (*Passer domesticus*): the model species

Experiments were carried out on adult house sparrow (*Passer domesticus*) Linnaeus, locally called as gouriya (in Hindi, Urdu). House sparrows have a cosmopolitan distribution. These are found practically all over the globe and undoubtedly most familiar to us.

This is a passerine finch, measuring 15 cm in length. Sparrows are very widespread and abundant resident birds, found everywhere in India except in Himalayas above about Bangladesh, Pakistan, Ceylon and Burma (Myanmar), but apparently absent in Andaman and Nicobar island (Ali and Ripley, 1974). Two races of Indian population of house sparrow have been recorded of them the Northern of North Western races are larger in size. House sparrow measures about 15 cm in length. Female are ashy gray brown above, streapal with blackish and rufous and with a pale fulvous super cilium, fulvous ashy white below. It’s sexually dimorphic species: and female are distinctly coloured. The colour of the bill in males changes annually and is androgen dependent. In this species, the bill colour can be considered as a bioassay of the circulatory levels of testosterone.

They are commensals of man, and live with human habitations of every description. They are in noisy flocks except in breeding season when they keep in
pairs. Sparrows feed mostly on grass and weed-seeds and cereal grains. Food also comprises fruit- and flower buds, tender shoots, kitchen scraps and insects. Nestlings are exclusively non-vegetarian feeding on soft-bodied insects, caterpillars, etc.

Breeding season extends chiefly from March to June in the north, further extending till September or October in the central India, and throughout the year in southern India. Nest is usually an untidy bulky collection of straw, fibers, cotton strings or other rubbish, lined with feathers and placed in almost any kind of hole. Eggs are usually 4 (could be 3 to 6). Nest building is done by both sexes, but female does more of the incubation. Both parents render parental care.

**Procurement and maintenance**

Adult birds of both the sexes were procured locally. Wild-caught birds were acclimatized to captive conditions in an outdoor aviary before moving indoors. Food (seeds of kakuni, Setaria italica and paddy, Oriza sativa) and water were available *ad libitum*, and replenished once daily during daytime. Once every month, birds received in water glucose (Glucon-D, Heinz India Private Limited), vitamins (Vimeral, Glaxo-Smithkline Pharmaceutical Limited, Mumbai, India) and antibiotics (Tetracycline hydrochloride, Hoechst Roussel Vet. Ltd). Birds maintained good health under captive conditions.

**Lighting conditions**

Majority of the experiments were however performed within the laboratory. Light was available from compact fluorescent tubes (CFL, Phillips) at desired
intensity as indicated in the respective experiments. Automatic time switches (Müller clock) controlled the periods of light and dark. In caged condition, birds were kept in small groups of (size – 45 x 30 x 30 cm) were placed in the photoperiodic box (size–75 x 70 x 60 cm) for photoperiodic experiments.

**Experimental design and data collection**

All studies presented in this thesis consist of several experiments, and each of them had a specific experimental design. Hence, the experimental design is detailed in respective experiments. We had following measurements for determining the effects of an experiment. Data from these measurements were collected at the beginning and at end of the experiment, and at appropriate intervals during the experiment.

**Body mass**: The gain or loss in body mass accounts for more than 2/3 of the entire fat and rest of the muscle content in the body (King and Farner, 1965; Helms *et al.*, 1967; Wade and Bartness, 1984; Kumar, personal communication). Body mass was recorded to examine the effects on fat and body metabolism of sparrows under the experimental conditions. For this, at each observation, individual birds were weighed on a top pan balance providing an accuracy of 0.1g.

**Gonadal growth and regression**: Measurement of size of the gonads was considered as an index of gonadal growth and regression. For example, changes in dimensions of the testis in male sparrow and an ovarian follicle in female sparrow were considered accounting for sum-effects of the photoperiodic treatment over a period of time on
gonadotropin secretion (Lofts and Murton, 1973; Lofts et al., 1973; Lofts, 1975). Whereas testis growth was measured in testicular volume, ovarian growth was measured in diameter of the largest follicle. The measurements were done by unilateral laparotomy performed under local anesthesia as per procedure regularly employed in our laboratory (Kumar et al., 2001). Briefly, a small incision was made between last two ribs on the left flank, gonads were located within the abdominal cavity with the help of a spatula, and the size of left testis or largest ovarian follicle was measured using a caliper with reference to markings on a graph sheet (1 cm x 1 cm with 100 squares; each square is 0.01 mm$^2$). This procedure was quickly over, and incision sutured by the surgical thread. An antibacterial skin ointment (Soframycin skin cream, Aventis Pharma Ltd.) was applied on the wound. Healing was rapid; post-operative infections are usually absent from this procedure. Testis volume was calculated using formula $\frac{4}{3}\pi ab^2$, where $a$ and $b$ denote half of the long (length) and short (width) axes, respectively. In females, an ovarian follicle of a small or regressed ovary with indistinct follicles was scored as 0.1 mm in order to make the data statistically comparable.

**Statistical analysis**

Data generated from experiments are presented as mean ± SE. They were further analyzed statistically to produce more meaningful results. One-way analysis of variance with repeated measures (1-way RM ANOVA), followed by Newman-Keuls post hoc tests if ANOVA indicated the significance of difference, was employed to examine the effect of a photoperiodic treatment over a period of time. Similarly, two-
way ANOVA was also employed to analyze the effects when two factors (e.g. photoperiod and duration of the treatment) were taken into consideration. The means from three or more groups at one time point were compared using one-way ANOVA without repeated measures, and the means from only two groups at one time point were compared using Student’s t-test. In short-term experiments, before and after means of the same group were compared using paired t-test. Significance was always taken at P<0.05. Sokal and Rohlf (1981) was consulted and used for the purpose of statistical analysis.