SUMMARY

CHAPTER : 1

Annual testicular cycle of the Indian house crow (Corvus splendens) has been studied on the basis of histometric parameters like testicular volume, weight, diameter, histological features of seminiferous tubules and Leydig cells. The cycle has been divided into four phases viz., Preparatory, Progressive, Reproductive and Regressive phases. It has been observed that the crows at Baroda show a single annual breeding peak. This unimodal breeding activity pattern has been compared with other patterns reported earlier and its significance has been discussed. Behavioural influences and biventric regimes have been shown to induce apparently bimodal patterns. Interstitial cell cycle was observed to corroborate the findings.

CHAPTER : 2

The reproductive biology of female Indian house crows from winter through the postbreeding period was studied in Baroda, India. Maximum ovarian follicular development occurred after cessation of vigorous nestbuilding activity i.e. in May.
Determinate laying in these birds involved a mechanism, in which only as many follicles that form the normal number of eggs in the clutch attained diameters of ovulable size. Renesting was never attempted, suggesting that the crows breed only once in a year in the months of June and July. Ovarian correlates did not show any tendency for renesting, as there was neither any tendency for partial follicular maintenance through incubation period, nor there was any maintenance of oviducal glands. Postovulatory follicles were short lived.

Atretic follicles of three types were distinguished. Two of these—glandular and yolky—appeared to give rise to the third, i.e. the lipo-glandular type. Frequency of lipoglandular atretic follicles corresponded well with increasing intensity of events influenced by progesterone, viz. oviducal development, incubation behaviour and parental nest defense.

Ovarian stromal glands believed to stem from both connective tissue precursors (during nestbuilding period) and follicular atretic cells (during laying period). Stromal glands showed a single well-defined peak of development by the beginning of nestbuilding stage which lasted up to the end of the laying period.
Developmental and regressional characteristics of the ovarian histology generally agreed with that of many other birds.

CHAPTER : 3

The annual cycle of the cortical tissue of the adrenal gland has been described in terms of fractional cortical volume and mean nuclear diameter. Fractional cortical volume of the adreno-cortical tissue was found to be high during November and December. There was no sex-difference observed regarding the adreno-cortical activity.

Relative gland weight variations were also taken into account, but were found less important in ascertaining gland's activity.

High interrenal activity was found generally accompanied by utilization of energy reserves, for example, during incubation; and low activity was presumably associated with the replenishment of body tissues. Fat deposition in May, before egg-laying, occurred at a time of increasing interrenal activity which presumably induced hyperphagia which in turn prevented the catabolic effects of high glucocorticoid production. The significance of the annual interrenal cycle in relation to breeding is discussed.
Karyometric data suggested a topographic heterogeneity in the adrenocortical activity during certain periods. Nuclear sizes of the cortical tissue was found to increase steadily from November in both sexes, but the nuclei of the central part of the gland showed a greater variation as compared to peripheral zones. This suggested occurrence of a possible functional zonation of the adrenocortical tissues of this bird.

CHAPTER : 4

It was found that the glands in males were more active during the period, April to June, and in females during April to July on basis of parameters like nuclear diameter and cell-diameter. Their possible correlation with the reproductive activity in males as well as in females has been discussed. Results were also analysed in relation to seasons (chiefly temperature as a criterion), and it was noted that during later part of summer, and monsoon, glands were comparatively more active i.e. during the annual higher temperature phase.

Parathyroid glands were seen to show a distinct hypertrophy during breeding season of the crows but no definite conclusion could be drawn regarding its exact role in reproductive functions in this bird.
CHAPTER 5

Pineal glands have been studied for seasonal histological variations. Structural details of the pineal gland of the Indian house crow have been described. The gland could be more correctly described as "intermediate" between the solid lobular and saccular follicular types found in other vertebrates. Anatomical observations regarding different cell-types and nerve supply have been recorded. Annual variations in cellular dimensions and the changes in nuclear size have been observed and correlated with simultaneous changes occurring in gonads. It has been observed that the pineal gland were more active chiefly during regressive phases and also during non-breeding phases of gonads. Pineal glands were less active during breeding phase. Data pertaining to the state of glands' activity have been analyzed in relation to long and short day length. A generalization could be made that the glands (pineal) were less active during long-day length regimen and were more active during short-day length regimen of the year. Volume changes (of the gland proper) were less significant to assess the state of activity of the gland.
Pituitary gland histology was studied for its structural detail. Different histological techniques were employed to compare the results, in relation to tinctorial and cytochemical properties of the various cell-types thus identified. Wilson and Ezrin (1954) method was found to give good results and was best suited for studying different types of acidophils and basophiles. Monthwise variations in different cell-types in regard to cell-size, and population densities, were recorded. Data obtained throughout the year, were analysed to find out their activity cycle. From these data, following functional cell-types were designated.

(1) α - (caudal) acidophils as Somatotrophes (STH cells)
(2) η - (cephalic) acidophils as Prolactin or Luteotropic cells (LTH cells)
(3) β - basophils as Follicle stimulating cells (FSH cells)
(4) γ - basophils as Thyroid stimulating cells (TSH cells)
(5) γ - basophils as Lactogenic hormone secreting cells (LH cells)
(6) ε - amphophils as Adrenocorticotropin hormone secreting cells (ACTH cells)
(7) Chromophobes - (of unknown function(s))
Variations in thyroid histology included changes in mean epithelial cell height, which ranged from 1.88 μ for the least active thyroid, to 5.58 μ for the most active thyroids. Thyroid activity index, which ranged from 1.85 for the least active gland to 4.46 for the most active gland. No real differences in proportion of epithelium and colloid material were detected in males from different collection periods. This is attributable to high variability in thyroid activity during all collection periods with particularly high histologic variation in winter. Female thyroids also showed high variability in winter and during egg-laying, but had significantly high proportions of epithelium in nest-building and incubation periods. The magnitude of individual variation in TAI was higher in the female than in the males. No consistent significant variations were found in appearance of the colloid. It appeared that either sex did show a specific thyroid response to low temperature. In females, high thyroid activity preceding laying might reflect involvement of thyroxine in reproductive development. High activity during incubation and winter could be related to heat loss through the incubation patch. The thyroid activity index (TAI) and
nuclear size, seemed the most suitable manifestations of thyroid function in the Indian house crow.

CHAPTER : 8

Annual variations in the distribution pattern of total lipids, cholesterol, succinic dehydrogenase (SDH) and \( \Delta^5-3\beta \) hydroxysteroid dehydrogenase (\( \Delta^5-3\beta\)-HSDH) activities in the testes as well as ovaries of the Indian house crow, were studied histochemically. Significance of these variations with respect to active sex-hormone synthesis is discussed in relation to gonadal cycle. It has been observed that the lipids, cholesterol, SDH and \( \Delta^5-3\beta\)-HSDH activities, were at higher level during breeding season i.e. June and July. Lipids and cholesterol were accumulated much during regressive phases and these were found to be depleted gradually during recrudescence of gonads. It was observed that the cholesterol was less when \( \Delta^5-3\beta\)-HSDH activity was intense. From this observation, it could be said that the cholesterol was utilized during breeding period. Lowest (minimal) intensity of histochemically detectable cholesterol was noted during breeding season. Cyclic variations in the levels of cholesterol, total lipids and phospholipids were also studied. These showed a
parallel trend in variations with that noted by histo-
chemical findings. Total phospholipids were high during
the breeding phase and were at low level during the
regressed phase of gonadal cycle.

CHAPTER : 9

The short-term (10 and 15 days postoperative)
influence of pineal ablation on various endocrine glands
viz., pituitary, thyroid, parathyroid, adrenal and
gonads, was studied throughout the year under unaltered
natural photoperiods. No significant alterations were
noticed in different parameters selected for judging the
activity of these various glands. The results were
discussed in relation to the design of the experiment
and photoperiodic conditions. The inefficiency of
pineal to alter the functions of these glands was
presumably due to short period of experimentation and/or
due to unchanged photoperiodic conditions.