

## S U M M A R Y

Cyclic variations in the levels of total lipids and cholesterol in liver, gonads and blood plasma of the feral blue rock pigeon (Columba livia G.) were studied quantitatively in both sexes of birds (Chapter I). Declining levels of cholesterol positive lipids, particularly in the gonads, have been correlated with functional states of gonads with respect to active synthesis of sex-steroid hormones (March to May and late August to October). Decreasing levels of hepatic lipids in the females during these phases were in all probability indicative of their release (hormone mediated) in the blood plasma and steady uptake for egg-yolk synthesis. Higher levels of gonadal lipids and cholesterol have been taken as indicators of their non-utilization for hormonogenesis (particularly during June, July and early August and November to February). Hepatic cholesterol synthesis in the female birds appeared to be high as compared to that in the males. Ovarian lipids and cholesterol were 2-3 times higher than the testicular levels, a clear indication of sex difference.

Annual variations in the distribution patterns of neutral lipids, total lipids and  $\Delta^5$ - $3\beta$ -HSDH and  $17\beta$ -HSDH in the testes of feral pigeons were studied histochemically (Chapter II). Two peaks with respect to enzyme intensities

were encountered: 1. during March-May and 2. during late August to October when androgen production could have been high. Testicular lipids showed poor localization during these phases which indicated that cholesterol positive lipids were probably utilized for hormone synthesis. Enzyme intensities were relatively moderate from November to February and very low during June and July. Lipids were accumulated either in the interstitial cells of Leydig or in the seminiferous tubules during these months. With respect to steroid hormone synthesis, these, apparently were the non-functional months June and July depicted characteristic features typical of fully regressed state of gonads.

Seasonal histochemical variations in lipids and  $\Delta^5$ - $3\beta$ -HSDH &  $17\beta$ -HSDH were also studied in the case of gonads of female birds throughout the year (Chapter III). On the basis of lipid localization and the enzyme intensities, it was concluded that :

1. Ovaries exhibited a chief regressive phase in June-July which separated distinctly the two breeding phases.
2. Thecal and granulosa cells of the pre-ovulatory follicles are both actively involved in the synthesis of estrogens.

3. Post-ovulatory follicles may serve as temporary source for progesterone
4. Atretic follicles are the more likely sources of progestins.

3 OC- and 17 $\beta$ -hydroxysteroid dehydrogenase activities were studied histochemically in liver, kidney and intestine in both sexes of feral pigeons during non-breeding (June, July and early August ) and breeding (Late August, September and October) months (Chapter IV). Among the 3 tissues studied, liver showed maximum intensity of 3 OC-HSDH activity whereas 17 $\beta$ -HSDH was highest in kidney. Intestine exhibited feeble activities of these enzymes. Enzyme intensity in the 3 tissues was weak in the non-breeding months, increasing gradually through August and reaching to maximum in September and October. The role of these enzymes in the tissues in catabolic pathways of sex hormones (androgens and estrogens) is discussed and a correlation has been suggested with gonadal hormone output.

Ascorbic acid levels were assayed quantitatively in the liver, gonads, kidney and blood serum in both the sexes of the feral pigeon during the breeding (March-April) and non-breeding (June-July) phases (Chapter V). On the whole, low concentrations were observed during the former phase and higher levels in the latter period.

These have been correlated with the rate of synthesis and distribution of the vitamin itself, gonadal steroidogenesis (as evident from the intensities of gonadal  $\Delta^5$ - $3\beta$ -hydroxysteroid dehydrogenase) and the consequent probable effects of sex steroid hormones on the tissue levels of ascorbic acid.

Levels of 'malic' enzyme (NADP-malate dehydrogenase) and glucose-6-phosphate dehydrogenase (G-6-PDH) were estimated quantitatively in the liver and gonads of feral pigeons during breeding (March-April) and non-breeding (June-July) phases in both the sexes (Chapter VI). It was concluded that hepatic 'malic' enzyme played a chief role in lipogenesis and that G-6-PDH seemed to contribute negligibly in this respect. The lipogenic rate was apparently higher in the females than in males. In both the sexes, enzyme activities were found to be higher during the breeding phase and lower in the non-breeding phase. It appears, therefore, that these enzyme activities are under the influence of circulating sex hormone levels. The relative contributions of these enzymes to fatty acid synthesis have been emphasized.

Finally, the total body weights, gonadal weights and gonadal histology were studied in relation to important phases of reproductive cycles in both sexes (Chapter VII). Body weight during wet summer (June to September) appeared to be high in both the sexes, moderately higher in winter

and low in summer. The variations of body weights have been correlated with the availability of food supply, winter fattening and reproductive states. Two clear cut peaks in gonadal weights of both sexes were observed; one during March and April and second during September and October. June and July exhibited lowest gonadal weights. During the former two phases, active spermatogenesis was encountered whereas in June and July, seminiferous tubules were loaded with lipid rich cellular debris. Observations on spermatogenic activities, oogenesis and total gonadal weights all throughout the year corroborated the early deductions that feral pigeons have two breeding peaks and one chief regressive phase.