SUMMARY

CHAPTER 1

The diurnal variations (morning and evening) in the fat and glycogen contents of the liver were studied in the Rosy Pastor. The concentrations of both these metabolites were found to be greater in those birds which were collected in the evening hours than in the morning. The increase in fat content towards the time of migration was reflected in the liver of birds irrespective of the time they were collected. The glycogen level was initially decreased at both the times, but by the end of April (in premigratory phase) a significant rise was noticed. These diurnal and seasonal changes are discussed in correlation with adaptive hyperlipogenesis.

CHAPTER 2

The sodium, potassium and water contents of liver, muscle and kidney of Rosy Pastor were determined quantitatively. It was suggested that the outflux of potassium from the liver could be responsible for the reduction in water content. Along with the diminished water content, the level of fat was found to increase. The outflux of K^+ from kidney and muscle was followed by an influx of Na^+. Although the muscle fat increased, a considerable reduction in the water content as in the liver was not noted. This insignificant change in the muscle, however, is suggested to be due to the reduction of extracellular space. The decreased concentrations of K and water in the liver and the interchanges of K^+ and Na^+ in muscle and kidney were reasoned

to be the result of the influence of corticosteroids, while the changes in the liver osmotic pressure due to the outflux of K^+ and water facilitates increased production and storage of fat, as well as enhanced entry of glucose.

CHAPTER 3

The calcium level in the liver, muscle and kidney of Rosy Pastor was determined flame photometrically. The liver Ca showed a rise by middle of April and a subsequent reduction, while in muscle it increased towards the end of the month. The kidney Ca level which showed an initial increase was comparatively negligible in its variance. Certain possible roles of Ca in the premigratory preparations and possible reasons for the changes in its concentrations are discussed. Lipid and non-lipid phosphorus levels in the liver were also assessed. While, non-lipid phosphorus showed a steady increase in the premigratory period, the lipid phosphorus registered a fall during this period, as compared to the values in the postmigratory period. This is suggestive of a reduced phospholipid synthesis in the liver in March/April, and the possible causes of it are also envisaged.

CHAPTER 4

The iron content of the liver and muscle (pectoralis) of the migratory starling (Sturnus roseus), was studied. In the liver the iron level was found to rise in the postmigratory period while in premigratory period a gradual decline was noticed. In the muscle a moderate but consistent increase of the

amount of iron was observed. The relationship of such changes of liver iron with erythropoiesis is discussed. The significance of the noted increase in the muscle iron towards the end of April is correlated with adaptive mechanism of the muscle for higher oxygen utilization.

CHAPTER 5

Red blood cell production and destruction and haemoglobin content were studied in a migratory bird, Rosy Pastor (Sturnus roseus). An increased cell destruction in the postmigratory period and an accelerated erythropoiesis in the premigratory period were observed. These findings were correlated with several environmental, hormonal and physiological factors. Since the increased erythropoiesis during the premigratory period also brought about a corresponding rise in the Hb content, these phenomena are suggested to be an adaptation whereby the oxygen carrying capacity of the blood is increased.

CHAPTER 6

Lymphocytopoiesis in the migratory bird (Sturnus roseus) and some non-migratory birds such as pigeon was studied. The liver of pigeon was found to contain large number of haematopoietic nodules just as in the case of Rosy Pastor. These nodules were lymphocytopoietic in nature. A possible relationship of the number of nodules per unit area with the amount of fat in the liver as well as in adipose tissue was observed. Similarly, the weight and size of spleen was also found to increase with the amount of fat in the adipose tissue of Rosy Pastor and pigeon.

The significance of such increased production of lymphocytes in erythropoiesis and deposition of fat in adipose tissue is discussed.

CHAPTER 7

The ascorbic acid content in the liver of Rosy Pastors during the post and pre migratory periods was studied. An increase towards the time of migration was apparent from the obtained data. Since it is known that ascorbic acid, if not being greatly essential, at least enhances the reactions in the fat, carbohydrate and iron metabolisms, the possible influences exterted by ascorbic acid in such reactions in the Rosy Pastor is discussed.

CHAPTER 8

Tyrosine level in the blood serum is known to fluctuate with the intensity of thyroid activity. When the level of this amino acid was determined periodically in the blood of Rosy Pastors during the period when this gland was reported to be very active (premigratory period), a gradual increase in the level of tyrosine was observed. In the last week of April the concentration of tyrosine increased immensely. This showed a difference in the concentration of thyroxine secreted into the blood during March to second week of April and last week of April. Just before the migration the thyroid hormone was released in very high concentration. Hence, possible metabolic manifestations influenced by varying concentrations of thyroxine are discussed.

CHAPTER 9

Localizations and changes in the activities of acetyl-

and butyryl- cholinesterases in the liver of Rosy Pastor, Common Myna and Pigeon were studied by the modified method of Koelle and Friedenwald (1949). In the Rosy Pastor during the postmigratory period the AChE activity in the liver was seen predominantly localized in the lining of the central vein and blood vessels whereas the BuChE was active in the parenchymal cells around the venules. During premigratory period the AChE was more active in the bile canaliculi while BuChE remained active in the parenchymal cells itself. In Common Myna, AChE showed a peribiliary and perivascular distribution and BuChE, periportal and perilobular. In Pigeon, AChE was localized in the centrolobular region while BuChE was uniformly distributed in the lobules. A seasonal and diurnal variation of AChE and BuChE activities was noticed in the liver of Rosy Pastor. Some possible connections of the activities of these esterases with bile production and food assimilation are suggested.

CHAPTER 10

A quantitative determination of glycogen contents in the superficial (SL) and deeper(DL) layers of the pectoral muscles of Rosy Pastor (Sturnus roseus), Brahminy Myna (Sturnus pagodarum) and House Sparrow (Passer domesticus) revealed a regional differentiation with regard to this metabolite present. In the Rosy Pastor and House Sparrow, the SL, whereas in Brahminy Myna, the DL, contained more glycogen. The assessments of the activities of phosphorylase, ATPase, SDH and AChE as well as the amount of glycogen in the various layers of the muscle of Sparrow after cold exposure for 5 hours were carried out. It was found

that phosphorylase, ATPase and AChE activities increased considerably in SL of the experimental birds in comparison to the controls. But the response of these enzymes varied with seasons, as in the cold season the birds were more or less acclimated. These observations are correlated with the functioning of the muscle and suggested that the pectoral muscle of Rosy Pastor is better adapted for long distant flights than its related non-migratory species.

CHAPTER 11

An integrated picture of various neuroendocrinological and physiological factors that are studied so far in the migratory starling, Rosy Pastor (Sturnus roseus) are presented. Probable mechanism and cause-effect factors of certain physiological changes in this bird prior to migration are suggested.