CHAPTER 3

HISTOLOGICAL STUDIES OF THE LIVER OF HILSA ILISHA AND HILSA TOLI

It is well known that the liver is the principal site for the storage and synthesis of fat. The role of liver in carbohydrate and protein metabolism is also well established. Fish liver stores fat and from the literature available it may be stated hormones play role in fat metabolism of fish. The adrenocortical hormones increase the size of liver, hepatic cell number and cell size (Chester Jones and Bellamy, 1964) in all vertebrates. Much less work has been carried out on lipid metabolism of fishes (as reviewed by Pickford and Atz, 1957; Baker-Cohen, 1961).

The work of Robertson and Wexler (1960) suggested that the degenerative changes noticed in liver and other organs of migratory spawning pacific salmon may be due to hyperactivity of adrenocortical tissue and aging process. The view was emphasized by the same authors (1962) after carrying out studies on the liver and other organs of senile castrated Kokanne salmon.

The present work was planned with a view to study histological changes in liver in relation with migration and spawning in migratory fish H. ilisha and to compare the same with those of non- migratory fish H. toli. The histological changes occuring in liver of drifted non-migratory H. toli were also studied.

MATERIALS AND METHODS

The live fishes were removed from net and were decapitated immediately. Small pieces of liver were fixed in Bouin's fluid. 5-6 μ paraffin sections were cut and stained with (1) Haematoxylin-eosin, (2) Gomori's aldehyde fuchsin and (3) Azan staining.

OBSERVATIONS

Histological structure of liver of fingerling of H. ilisha captured from river:

The compactly arranged hepatic cells possessed prominent round nuclei with finely granular chromatin material. The round nucleolus was always situated centrally in the nucleus. Many granules were noticed in the cytoplasm of the cells. Very few vacuoles were observed in the cytoplasm of the cells(Fig. 1). The presence of many small sized blood vessels was a prominent feature.

Liver of immature H. ilisha captured from sea:

The cells were compactly arranged. Many vacuoles were noticed in the cytoplasm of the cells. This must have been due to dissolving of fat during dehydration. Gelatin sections stained with Sudan Black B revealed intracellular fat deposition. The blood cells were scattered in intercellular spaces. The nuclei of the hepatic cells were large, round and filled with finely granular chromatin material (Fig. 2).

Yellow pigments in the form of clumps were noticed throughout the region. This may represent lymphocytes.

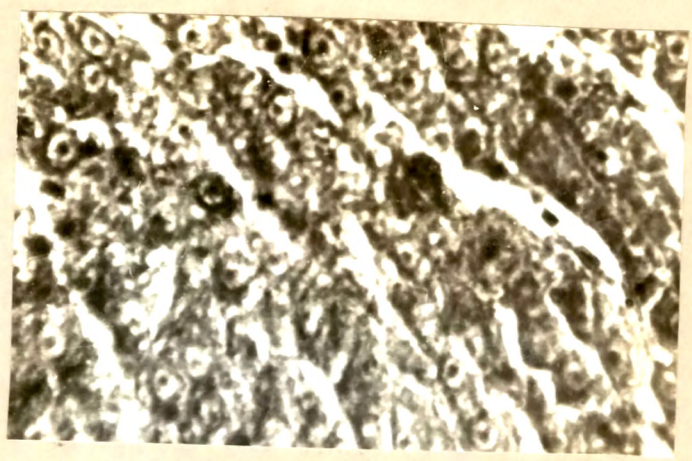

Fig.1

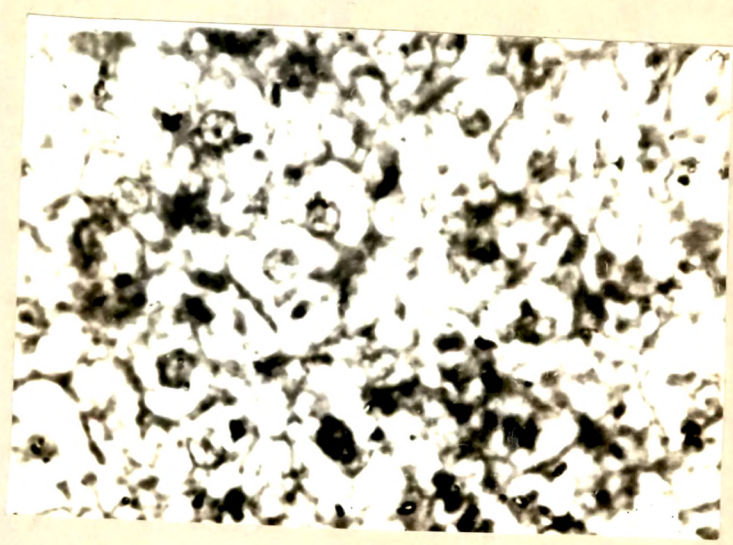

Fig.2

Fig.1 T.S. of liver of fingerling of H.ilisha showing normal cells with granules. HE. X1000.

Fig.2 T.S.of liver of immature H.ilisha showing large round nuclei and empty spaces in cytoplasm due to dissolution ofvlipid. HE.X1000.

Liver of mature H. ilisha captured from sea prior to migration:

The hepatic cells were loosely arranged and the cytoplasm showed a weak eosin staining. The presence of many vacuoles in cytoplasm suggests the presence of fat in them. This was confirmed by Sudan Black B staining in gelatin sections. Cell boundaries were much more distinct. Nuclei did not show strong affinity towards haematoxylin staining unlike the nuclei of the hepatic cells of immature H. ilisha. Except very few, the nuclei were perfectly round in shape. The chromatin material was little and scattered in the nucleus. Prominent nucleolus was also discernible.

Many large sized blood vessels with densely packed blood cells were noticed. In some of the arteries beginning of arteriosclerosis was observed.

Liver of mature migrating, spawning H. ilisha captured from river:

The hepatic cells were much loosely arranged and in most of the intercellular spaces the blood cells were noticed. Cytoplasm showed very weak eosinophilic staining. In many cells the nucleus was in contact with cell membrane by means of fine thread like cytoplasm. Nuclei of some cells were pycnotic, a few were with normal round shape (Fig. 3). The chromatin materia was in the from of fine granules scattered at the periphery. The presence of many vacuoles in the hepatic cells was due to loss of fat droplets as was evident by Sudan Black B staining. In arteries arteriosclerosis was noticed. The deposition of

collagen was also noted.

Liver of spent H. ilisha captured from river:

The degenerative changes observed in mature migrating H. ilisha were observed here at its climax (Fig. 4). The advanced arteriosclerosis was a prominent feature. In some of the arteries the intima was separated from the other layers. The deposition of collagen and fat in the intimal layer was observed. The destruction of intimal layer (Fig. 5) and in many arteries the projection of the intimal layer into the lumen of the artery was noticed (Fig. 6). Most of the hepatic cells were with distorted and pycnotic nuclei. The cytoplasm had diminished in volume. Many cells showed necrosis also. Their nuclei were shifted to one end of the cell. The presence of many blood cells in the much enlarged intercellular spaces was a conspicuous feature.

The histological structure of the liver of immature and mature H. toli resembled that of the immature and mature H. ilisha captured from sea.

Liver of drifted H. toli captured from estuary:

Many blood vessels of large size were noticed in the liver of drifted H. toli. In many arteries the arterial wall was found broken. An advanced stage of arteriosclerosis was noticed.

The cytoplasm of cell gave curdled appearance and showed less affinity for eosin staining. Some of the cells appeared to have been destroyed leaving empty spaces behind.

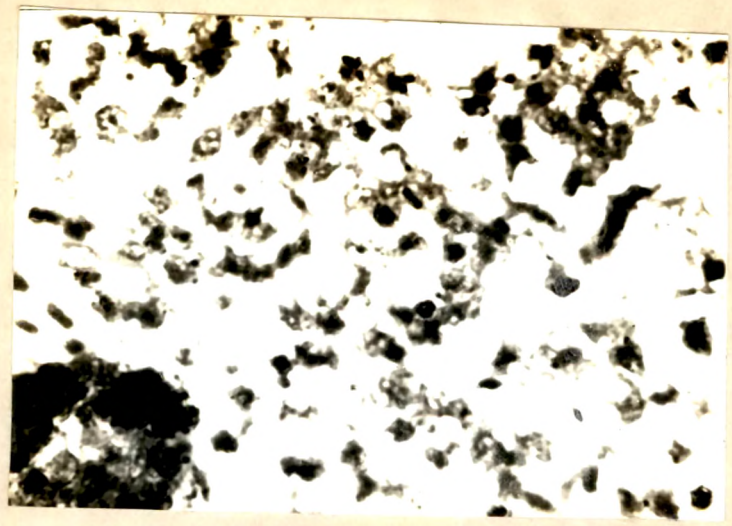

Fig.3

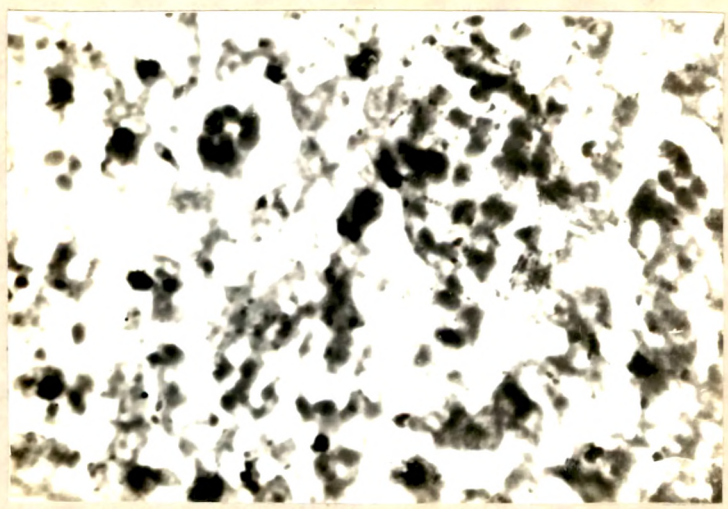

Fig.4

Fig.3 T.S. of liver of mature H.ilisha showing degenaration
HE X 1000

Fig.4 T.S. of liver of spent H.ilisha showing degeneration.
HE X 1000

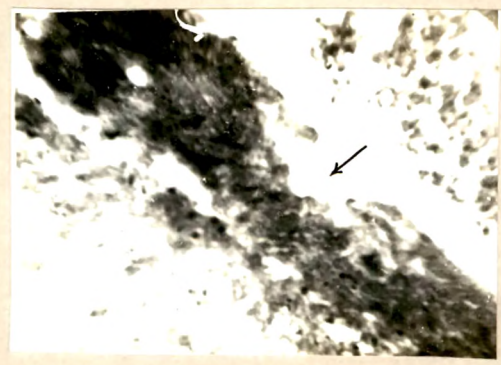

Fig. 5

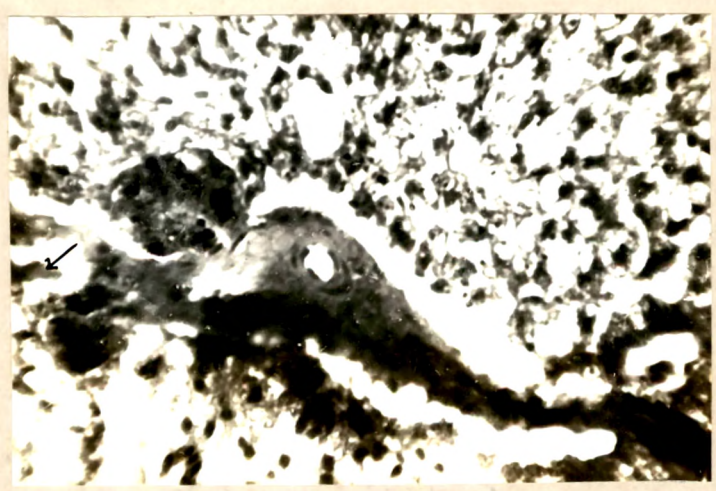

Fig. 6

Fig. 5. Destruction (arrow) of the wall of artery in the liver of spent H. ilisha. H.E. X 630.

Fig. 6. T.S. of the liver of spent H. ilisha showing formation of nodules (arrow) in the wall of artery. H.E. X 630.

In some hepatic cells nuclei were lost leaving only cytoplasm behind. Most of the nuclei were pycnotic and round in shape. A few normal nuclei with nucleolus were observed. In some cells the empty nuclei had acquired a much enlarged circular shape. This condition was also observed in immature and spent drifted H. toli.

DISCUSSION

The degenerative changes noticed in the liver of migrating H. ilisha and non-migrating H. toli are similar to those observed in migrating and spawning pacific salmon by Robertson and Wexler (1960). The following factors associated with aging can be considered responsibile for degenerative changes in liver. 1- Stress due to spawning and starvation during spawning and migration. 2- Hyperadrenocorticism. Both the factors are more pronounced in migrating H. ilisha as it has to encounter a change in the external medium and also it has developed more pronounced hyperplasia of adrenocortical tissues.(Desai, 1967). From the present observations it is evident that H. ilisha exhibit more pronounced degenerative changes. Robertson and Wexler (1960) suggested that degenerative changes observed in various tissues and organs were due to increase in adrenocortical tissue associated with aging and increase in the level of 17-hydroxycorticosteroids in blood. Thus the histological observations in case of H. ilisha are in line with those of Robertson and Wexler (1960). The necrosis of liver noticed by Robertson and Wexler (1962) in senile castrated Kokanee salmon was attributed by them to

hyperactivity of adrenocortical tissue in association with aging. Similar degenerative changes were observed in the present study in spent H. ilisha cpatured from river.

In H. toli, of all stages studied,the degenerative changes were the maximum in those drifted into the river. In the same stage, destruction of some cells of the adrenocortical tissue accompanied with increase in secretory activity were noticed.(Desai, 1967). Had aging and maturity been the prime factor, then these changes could not have occurred in the immature drifted H. toli. The adrenocortical tissue of immature, mature and spent drifted H. toli showed pronounced degenerative and destructive changes (Desai, 1967), and this may be due to the inability of adrenocortical tissue to cope up with the increase in demand of mineralocorticoids and glucocorticoids with the result that some cells were destroyed and the remaining cells exhibiting hyperactivity. Although no direct evidence is available, it is attractive to speculate that hyperactivity of the adrenocortical tissue played an important rôle in effecting the pronounced degenerative changes in the liver of drifted H. toli. In H. ilisha the association of hyperactivity of adrenocortical tissue with aging, stress due to spawning, starvation and change in external media cannot be ruled out.