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SEASONAL HISTOLOGICAL CHANGES IN THE TESTES OF MUGIL SEHELI IN SUEZ BAY.

By

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ABSTRACT

The survey of the gonadal anatomy and histology has revealed the occurrence of seven developmental stages in the testis of Mugil seheli including: immature virgin (May to July), 2: developing virgin and recovering spent (August to October), 3: maturing stage (October), 4: mature (November), 5: ripe stage (November to December), 6: spawning stage (January and February) and 7: spent stage (March and April). Five types of spermatic cells could be demonstrated during spermatogenesis - spermatogonia, primary spermatocyte, secondary spermatocyte, spermatid and sperms.

The spawning season of male Mugil seheli is long, it extended from November to March with a peak during November.

INTRODUCTION

Many species of family Mugilidae are of significant commercial importance. In Suez Bay, the most common species of mullets is Mugil seheli, the other species Mugil capito, Mugil cephalus, Mugil saliens and Mugil auratus are rarely found in Suez Bay and generally appear at different periods of the year. In Suez Bay Mugil seheli shares a considerable part in the commercial catch.

Although several investigators have studied the gonadal reproductive cycle of female teleosts, similar studies on male fish are relatively few. However, important contributions on the testicular cycle of teleosts have been made by (Latif and Saady 1973; Sherstha and Khanna 1978; Rijnsdorp 1989).

In the present paper; studying the histological characteristics of testes of fish give a back ground on the seasonal changes in the male sexual glands as well as in the reproductive cycle of the fish.

MATERIALS AND METHODS

Living specimens of Mugil seheli were collected from Suez Bay during the period, May/1991 and April/1992. Their total length, total weight and the date of capture were recorded. The abdominal cavity was opened and the testis were removed, fixed in Bouin's fixing fluid, dehydrated, cleared and embedded in paraffin. Sections of 5-8 um thick were done. Staining was done by Ierich with, Ierich haematoxyline, Heidenhain iron haematoxylin (eosin was used as counter stain) and Milligant trichrome stain. The gonado somatic index (GSI) for every month was estimated as below:

(GSI = wt. of the gonad (gm)/ gutted body weight (gm) X 100).

RESULTS

Macroscopic structure and maturity stages:

The testis of Mugil seheli consists of a pair of elongated flattened organs of almost equal size, lying below the alimentary canal along the body cavity and are suspended by mesorchium. The maturity of testes can be classified into seven stages according to their shape, colour and size. Based on agross examination, the following stages in the development of testis could be mad out: immature stage, developing or recovering spent, maturing stage, mature stage, ripe stage, spawning stage and spent stage.

Histology of testis:

Spermatogenesis can be devided into five developmental stages: Spermatogonia, primary and secondary spermatocytes, spermatids and spermatozoa.

(1) Spermatogonia: These are large cells. They are often observed in nests and are also found in most stages of testis maturation. The cells of spermatogonia have a diameter varying from 10 to 14 um with a pale cytoplasm. They have a large nucleus and dark staining nucleolus which frequently lies in the central zone of the nucleus.

(2) Primary spermatocyte: These cells formed by mitotic division of spermatogonia and occur in groups. The primary spermatocytes are smaller than spermatogonia, they have a diameter of about 7um with density staining nuclei and the chromatin is patchy, Fig. (2).

(3) Secondary spermatocyte: The secondary spermatocyte is about 5 um in diameter and found in groups. In addition to being smaller than primary spermatocytes, they have more homogenously staining nuclei, Fig. (3). These cells are formed by meiotic division of primary spermatocytes. The chromatin in the nucleus of these cells is very dense. They are found in large nests extending into the lobule lumen.

(4) Spermatid: Secondary spermatocytes divide mitotically to form spermatids which have no distinguishable cytoplasm. These cells have diameter about 2 um., contain densily staining nuclei which occupy most of the cell.

(5) Spermatozoa: Metamorphosis of spermatids (spermiogenesis) to form spermatozoa occur within the lobules lumen. This stage is most evident in the testis during spawning. The sperms often retain their organization into parachute-shaped clumps due to adhesion of the sperms tails.

Histological characters of maturity stages of the testis:

Stage I: (immature): This stage extends from May to July. The completely immature or infantile testis consists of small closely packed cysts or nests of spermatogonia which were arranged into lobules. The walls of the lobules made up of connective tissue. Blood vessels are often un-defined, (Fig. 1).

Stage II: (developing or recovering spent): This stage extends from August to October. Sections of the developing or recovering spent testis exhibited incipient active spermatogenesis. In this stage the network of lobules has become looser in structure and is lined with several layers of spermatogonia. After several spermatogonial division whithin the cyst, primary spermatocytes, secondary spermatocytes and spermatids are formed. But in this stage the spermatogonia are predominent than previous cells. The spermatic duct in this stage is empty (Fig. 2 and 3).

Stage III (maturing) : This stage extends to late October and characterized by the appearance of the first sperms in the lobule lumin. Primary spermatocytes appear to be the most common cell type at this stage, but these are continually dividing to form large numbers of secondary spermatocytes which rapidly mature to form spermatids and then spermatozoa. At the end of this stage, the lobules are distended by primary, secondary spermatocyte, spermatids and sperms. Spermatogonia are seldom detected.

The spermatozoa lie in parachute shaped culmps, these formations apparently are due to adhesion of the sperm tails (Figs. 4, 5, and 6).

Stage IV (mature): This stage extends from late October to end of November. It is characterized by the predominance of spermatozoa over all of the earlier cell stages present in the lobules. Many of the parachute-shaped sperms clumps have broken down, and the lumina of the lobules begin to be filled with free sperms. The spermatic duct is also full of sperms (Fig. 7).

Stage V (ripe): This stage extends from end of November to end of December. At this stage the lobules and ducts are packed with mature spermatozoa, but the earlier germ cells are fewer and embeded in the lobule walls. The tunica is stretched to its minimum width and the lobules are distended to their maximum diameter, their walls also becoming thin and stretched (Figs.8&9).

Stage VI (spawning): This stage lasts from January to February. At this stage the fish discharged a considerable quantity of sperms, so reduction in the size of the lumen of the seminiferous lobules is observed (Fig. 10).

Stage VII (spent): This stage extends from March to April. The testes often contain residual sperms in lumen of the lobules. The wall of the lobules were loosely contracted. Also the lobules contained some nests of spermatogonia, primary and secondary spermatocytes. From these cells the following year's spermatogenetic cycle developed (Fig. 11).

Monthly changes in the testis during the reproductive cycle :

During May, June and July the testis of Mugil seheli exhibited immature stage. The main mass of the testis was made up of spermatogonia. The gonadosomatic index ranged from 0.035 to 0.09 . The wall of the testis was comparatively thin. The spermatic duct was narrow and devoid of sperms.

Through August and September some testis exhibited the above characters, but in others began active spermatogenesis and was forming primary, secondary spermatocytes and spermatids. The GSI ranged from 0.04 to 0.12 , some of the lobules were wider and had a discernible lumen. The spermatic duct was still devoid of sperm cells.

In October, the GSI of testes ranged from 0.04 to 2.36 . Some of testes showed the end of developing stage, where the lumen of lobules were filled with spermatids. In the periphery of lobules the primary and secondary spermatocytes were found. Blood cells can be detected between the lobules. The spermatic duct was still empty.

In the other testes, they showed the beginning of maturation where the first appearance of sperms in the lobules-lumina. Spermatogonia were seldom detected. Also in the spermatic duct there were a fair quantity of sperms.

In November the GSI of testes ranged from 1.36 to 6.06 . In this month some of testes exhibit the above characters in the preceding month, but others exhibited the characters of mature stage. Sperms in the lobules took the parachute shape and were found in the lobules lumen. The spermatic duct was full of sperms.

In December the GSI of testes ranged from 0.92 to 6.61 . The lobules of some testes were found in the mature stage as in the month of November while others were found in the ripe stage, where the parachute shape were broken. All the lobules and spermatic duct full with sperms.

During, January and February the testes discharged a considerable amount of their sperms. The lobules slightly shrank and the GSI of testes ranged from 0.39 to 2.09 .

Through March and April the GSI of testes decreased to minimum value and ranged from 0.04 to 1.5 .Most of the testes were present in the spent stage. The lobules contain the remains of undischarged spermatozoa, but in some lobules there were a number of resting spermatogonia, primary and secondary spermatocytes responsible for spermatogenesis in the next spawning season.

From the above, it can be seen that spermatogenic activity in Mugil seheli begans in May and extended to October, attained its maximum in November, when the lobules full of spermatids, sperms and spermatogenesis then slow down and by April it almost stoped (GSI minimum).

From the present study Mugil seheli has a prolonged spawning season extending from November to March with a peak during November.

DISCUSSION

The most common arrangement of lobules would appear to be that of the radial type, they are converging on the spermatic duct. This arrangement has been described by Turner (1919) in Perca flavescens, Lofts and Marshall (1957) in Esox lucius and Latif and Saady (1973) in Tilapia nilotica. While Rastogi (1968) mentioned that, the lobules of Amphipnous cuchia run lengthwise with lateral communications becoming evident during the prespawning and spawning periods.

In case of Mugil seheli, it is found that the lobules arrangement appear as radial type. This type of testis derives its name from the radial arrangement of the seminiferous lobules. Latif and Saady (1973) named this type as percoid because it is prevalent in the percoid fishes.

Grier et al., (1980) in their study on the testicular structure in Salmoniforms, Perciforms, Cypriniforms and Atheriniforms has been examined and reinterpreted on the basis of two different tubular types, distinguished from each other by the intratubular distribution of spermatogonia. In the Salmoniform, Perciform and Cypriniform teleosts studies, spermatogonia are distributed along the entire length of the testicular tubules (unrestricted tubules). However, in the Atheriniform teleosts spermatogonia are restricted to the distal end of tubules (restricted tubules).

In the present observation on Mugil seheli, the tubules belongs to the unrestricted tubule type. This agree with Grier et al. (1980) in Salmoniforms, Perciforms and Cypriniforms.

Butskaya, (1959) mentioned that, according to the type of spawning whether it is long or short, the spermatogenetic process and the character of sperm cell discharge are varied. The fishes with long spawning season, produce adaptation to protracted and continuous spawning. They are characterized by fractional discharge of the sperm cell. This agrees with the present study on Mugil seheli where the spawning season for male is long. Conversely, in fishes where spawning season is short, discharge of sperms is a rapid process.

For male of Mugil seheli prolonged spawning season is enhanced by the presence of different individuals at different levels of maturity in the same period during spawning. Besides, additional amounts of sperms are always formed during the spawning period. This results therefore support the findings of Latif and Saady (1973) in Tilapia nilotica and Asem (1992) in Oblada melanura.

In Mugil seheli, no phagocytosis was observed. These results agrees with pollard (1972). While, Henderson (1962) found that, in Salvelinus fontinalis after completion of the spawning season, phagocytes invade the lumina of the testis lobules and sperm ducts and ingest the residual sperms.

In Mugil seheli, spermatogonia are present throughout the year in the peripheral zone of the lobules but their numbers are greatly reduced during spawning season, this is in agreement with (Kulayev 1927; Bisht 1974 and Asem 1992).

So, we can conclude that, reserve germ cells, present in Mugil seheli throughout the year, give rise to the next crop of spermatogenetic cells.

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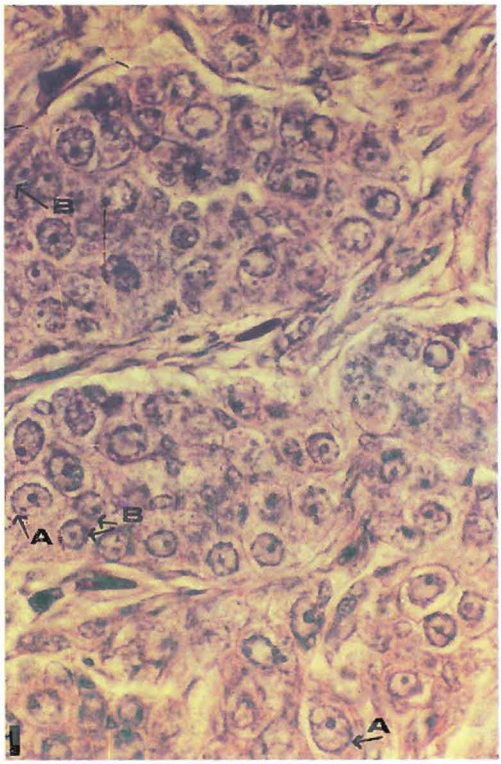
LIST OF FIGURES

Figure (8): T.s. of the testis at the ripe stage showing the sperms in the lobules. heidenhain iron haematoxylin (x 50).

Figure (9): T.s. of the testis at the ripe stage showing the sperms in the lobules (a) and the wall of the lobule (b). Hih (x 100).

Figure (10): T.s. of the testis at the spawning stage. Hih (x 10).

Figure (11): T.s. of the testis at the spent stage. (a) thick wall of lobules, (b) rest of spermatogonia, (c) residual of sperms. Hih (x 100).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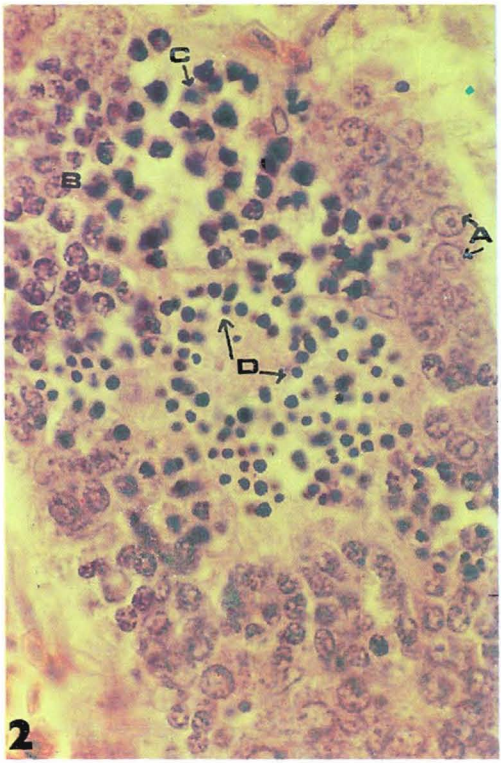
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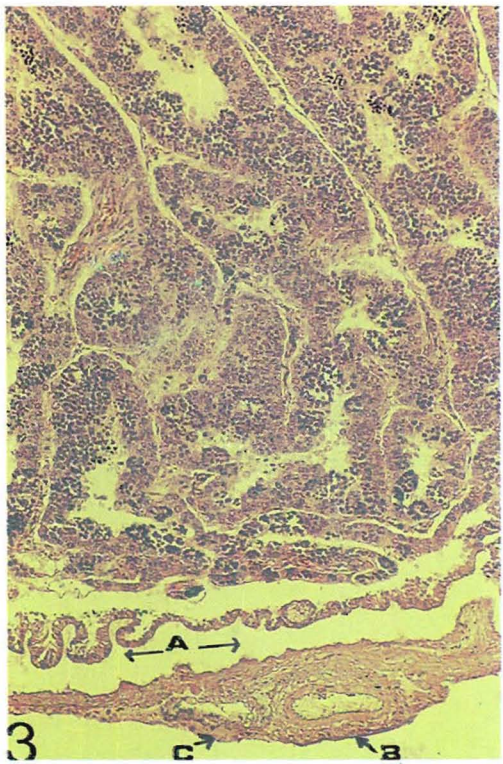
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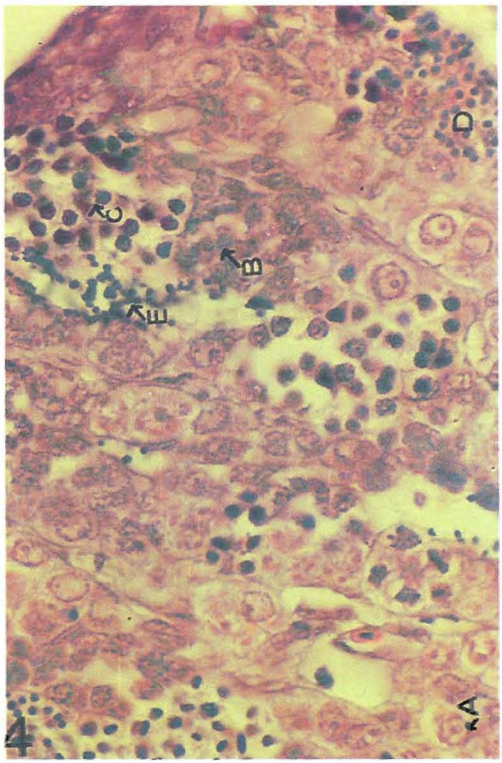
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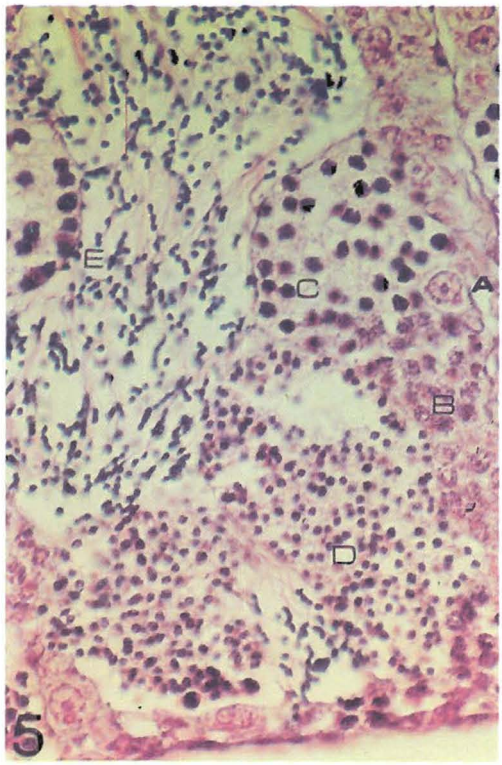
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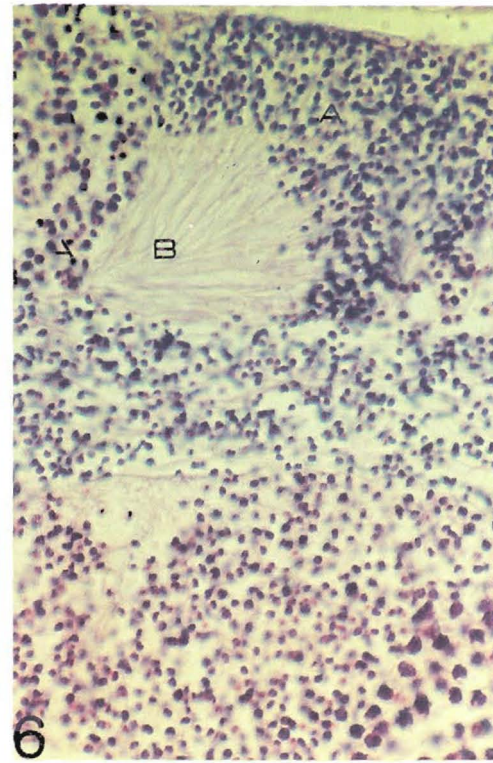
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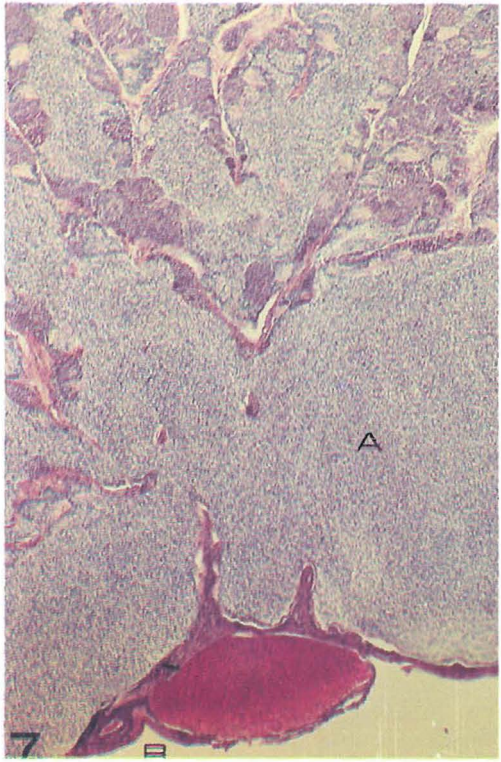
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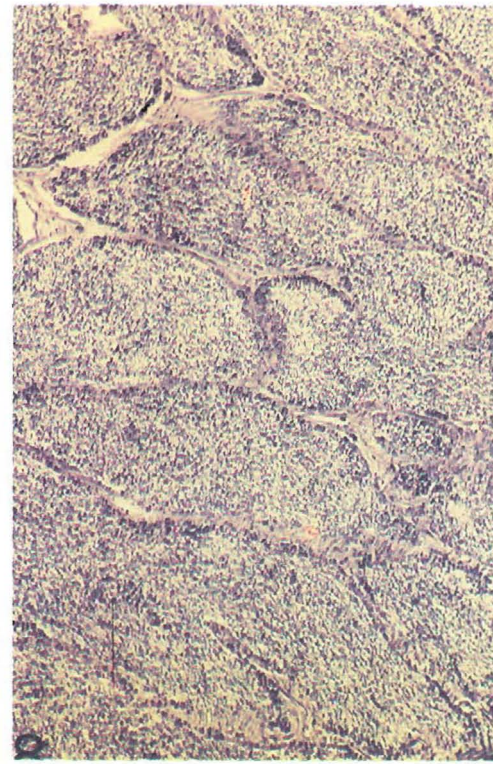

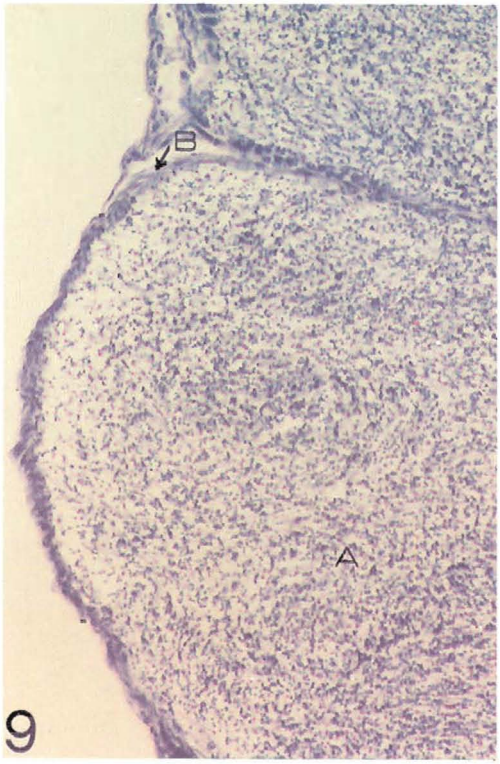

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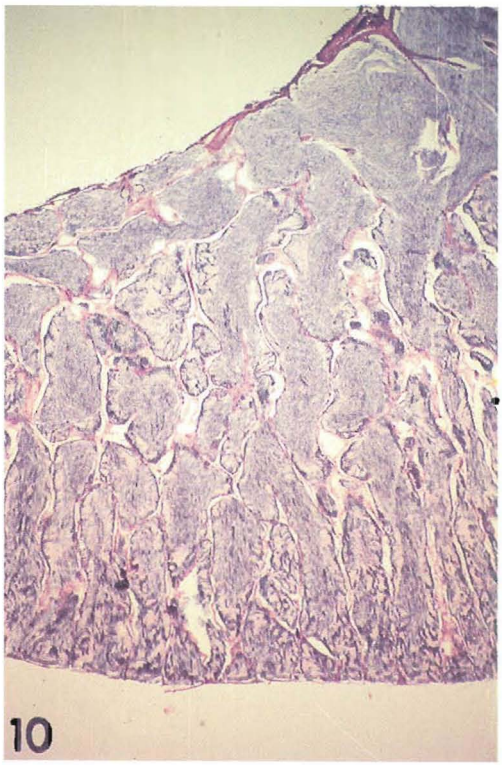

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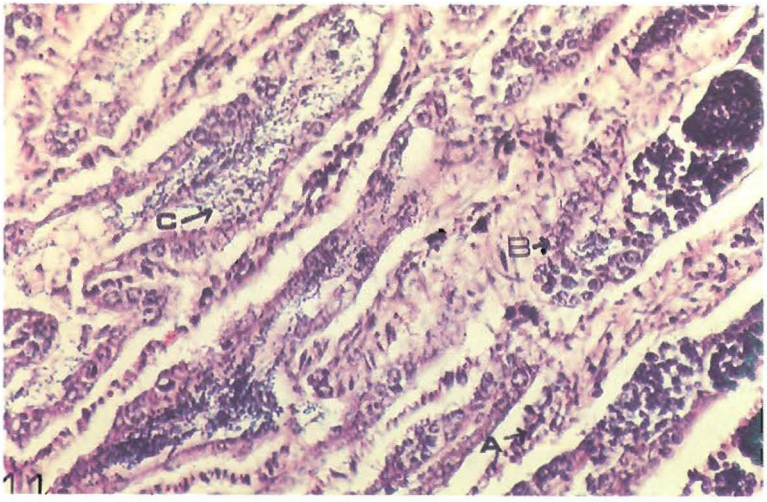

11