

**MORPHOLOGICAL DESCRIPTION AND
HISTOLOGICAL STRUCTURE OF THE LIVER IN
ADULT GUPPY FISH**

Poecilia reticulata

Poecilia الوصف الشكلاني والتركيب النسيجي للكبد في سمكة الكوبي البالغة
reticulate

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ABSTRACT

The liver of adult guppy fish was represented by one irregular lobe located on the left side of digestive tube curved a little to the right at the posterior part. The liver lacked the trabeculae which divide its matrix into lobules and the matrix of liver was formed from plates or cords of hepatic cells arranged around the central veins sections and were separated from each other by sinusoids. The hepatic cells were polygonal in shape, large in size, light - staining, acidophilic cytoplasm and were containing spherical nucleus situated centerly and containing nucleoli. The sections of the branches of hepatic portal vein, hepatic artery and bile duct were scattered in the matrix of liver .

Keyword: guppy fish, liver, morphology, histology.

الخلاصة :

تمثل كبد سمكة الكوبي البالغة بفص مفرد غير منتظم الشكل، يقع الى الجانب الأيسر من الأنبوب الهضمي إلا انه ينثني قليلا باتجاه الجانب الأيمن عند نهايته الأمامية. افتقد الكبد إلى وجود الحويصلات التي تقسم متنه إلى فصيصات، وتكون متن الكبد من صفائح أو حبال من الخلايا الكبدية المترتبة بصورة شعاعية حول مقاطع الأوردة المركزية والمفصولة عن بعضها بالجيبانيات الدموية. وكانت الخلايا الكبدية مضلعة الشكل كبيرة الحجم فاتحة الصبغ ذات سايتوبلازم متجانس باهت متقبل للأصبغ الحامضية وحاوية على نوى كروية مركزية الموقع متوسطة الحجم ذات مادة كروماتينية قليلة حاوية على نوية واضحة داكنة الصبغ تحتل مركز النواة. ظهرت فروع كل من الوريد البابي الكبدي والشريان الكبدى وقناة الصفراء منتشرة بصورة منفصلة ضمن متن الكبد.

****الكلمات المفتاحية :** سمكة الكوبي، الكبد، الوصف الشكلاني، التركيب النسيجي .

INTRODUCTION

Guppy fish , *Poecilia reticulata* , commonly known as million fish ,or more likely to be called as rainbow fish ,belongs to the family Poeciliidae (livebearer).It has about 200 species coming from 16 genera .Guppies are neotropical species which are natives of Northwestern South America ,and was then introduced in many countries in Asia and other continents [1]. They are typically small,brackish or fresh-water dwellers in which males have maximum length of (3.5)cm,and females having (6)cm.Females are pale olive-colored with transparent fins and are typically larger than males.Males on the other hand are polychromatic,which means they have a variation of color combinations especially in their sides and fins.These colors are usually red,orang,yellow,blue,and green with white and black patches.With these variable coloration , no two males are identical in terms of pigment patterns[2].The male fish also possesses a gonopodium, which is a modification of the anal fin used in reproduction and is stick like in appearance [3].

The liver is one of the large glands associated with the digestive system , and plays an important role in the body. It has many functions, including metabolism of proteins and carbohydrates, formation and secretion of bile, as well as its participation in the disposal of internal waste, poisons and external drugs, storage of fat and glycogen [4] and production of antibodies during larval roles [5].

The liver in fish shows variation in the number of lobes as well as the large formality changes that can be observed in different species, may be with a single elongated lobe as in a fish *Esox Lucius* [6],which may be a single saddle-shaped lobe as in a fish *Plecoglossus altivelis* [7], which may be single irregular shaped lobe as in a fish *Gambusia affinis*[8] or two lobes, like *Gasterosteus aculeatus* [9], and may consist of three lobes as in *Polyodon spathula*[10], or several irregularly shaped lobules as in the fish *Cyprinus carpio* [11].

The liver in *Gasterosteus aculeatus*[9], *Esox Lucius*[6], *Polyodon spathula* [10], *Percina caprodes* [12], *Anguilla Anguilla* [13] and *Gambusia affinis* [8] is lacking trabeculae which divide the organ into lobules, and material of the liver arranged in the plates cells or cords of the hepatic cells a radiograph around the central veins, hepatic cords separated by the Sinusoids.

Hepatic cells differ in their forms in different species of fish.Its may be Polyhedral cells, such as *Gasterosteus aculeatus*[9] and *Micropogon undulates* [14],and may be polygonal cells as in *Lota lota* [15] and *Salmo gairdneri* [16] or may be pyramidal cells such as *Plecoglossus altivelis* [7].

The aim of this study is to showing the morphological and histological structure of liver in adult guppy fish *Poecilia reticulata* .

MATERIALS AND METHODS

Samples collection :

Samples of adult guppy fish (males and females) were obtained from shops of ornamental fish in Babil province with total lengths ranging from (2 to 5) cm.

Morphological study :

Dissection made where the anatomy of a segment in the abdominal area in the presence of the liver and then work two sections perpendicular to the first segment of each side where the examination was performed using dissecting microscope.

Histological study :

According to Humason's method [17] liver was removed and then preserved in Bouin's fluid for (20) hours. The fixed tissue were washed by water and prepared sections of(5µm) by using microtome then make slides and stained with heamatoxylin and eosin and viewed with photographed by using digital (Nikon)and light microscope (Olympus).

RESULTS

Morphological description of the liver:

The morphological study showed that the liver of the adult guppy fish was represented by single irregular lobe located leftly from digestive tube , but was curved a little to the right at the posterior part (Figure 1,2).

Histological structure of the liver:

The histological study showed that the liver was encircled from the outside by a capsule of a simple squamous epithelial tissue, with its thinness extending from very thin incisions near the edge of the organ. The liver was lacking in the presence of the trabeculae that divide the tissue into lobules and the liver's plate was shown to be arranged in a cords of hepatic cells. Hepatic cords were radiating around sections of the central veins. Hepatic cords consist of rows of liver cells separated by small spaces represent sinusoids were lined with endothelial cells that show their nuclei towards the cavity (Fig. 3). Hepatic cells were appear as large, polygonal cells with low homogeneous cytoplasm accepted for acidic dyes and contains central spherical nuclei. The nuclei were containing a small mount from chromatin and dark-colored nucleoli which occupies the center of the nucleus (Fig. 4).

The hepatic portal vein, the hepatic artery, and the bile duct are spread separately within the liver (Figure 5). The hepatic portal vein was characterized by the thinness of its wall and its large cavities, and it was surrounded by the acini of hepatopancreas, which was completely or non completely and surrounded by an endothelial lining surrounded by some of smooth muscle fibers (Figure 5,6). The lining of the bile duct is composed of a single row of cuboidal cells (figure 7).

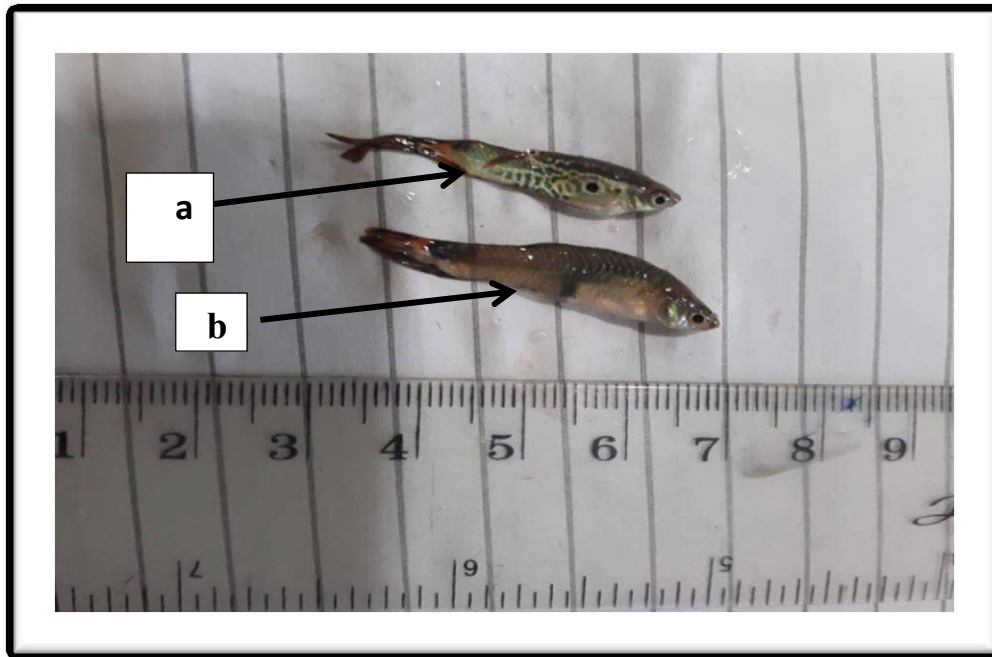
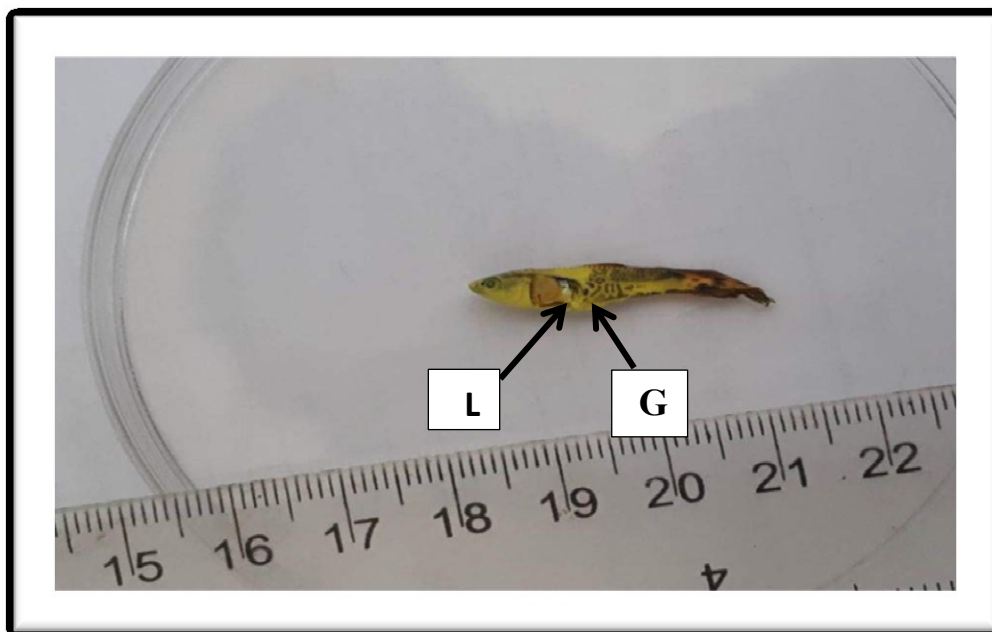


Figure 1: Showing external morphology of the male (a) and female(b) adult guppy fish .



**Figure 2: Showing liver location in adult guppy fish (male)
Liver (L),Gonopodium (G).**

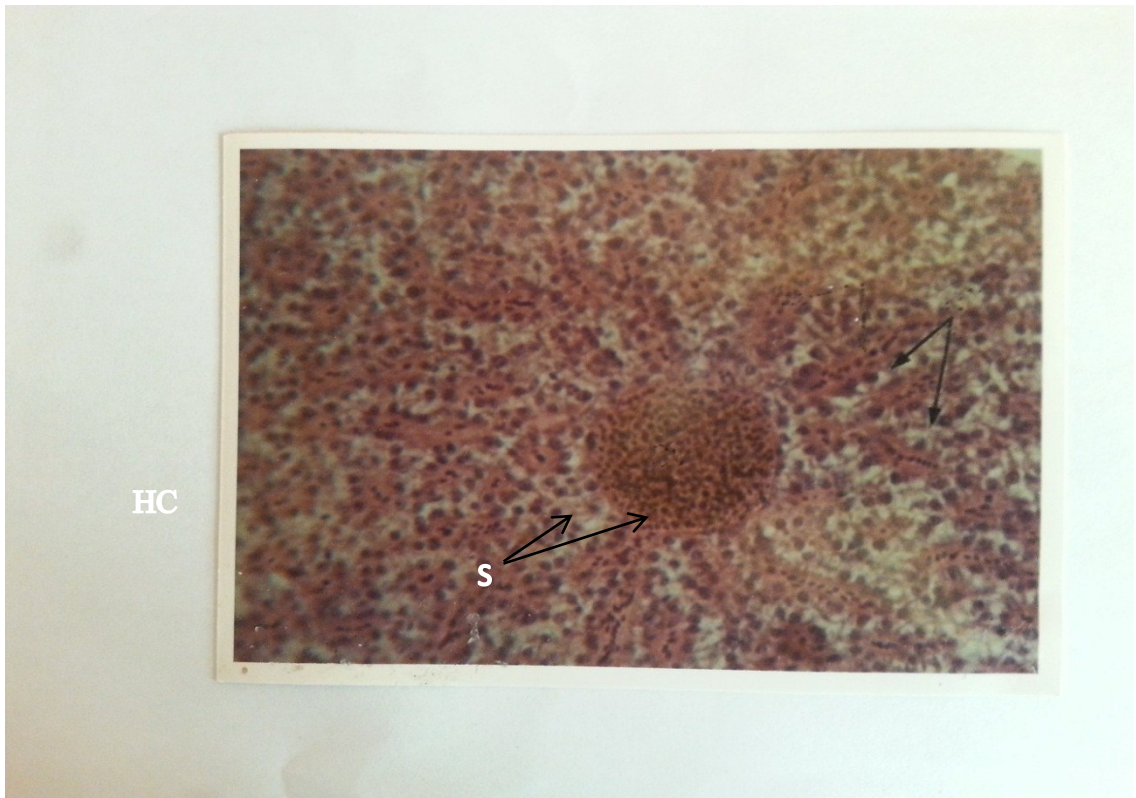


Figure 3: Cross section in liver of adult guppy fish showing arrangement of hepatic cord(HC) , central vein (CV),Sinusoids(S),(H&E,400x).

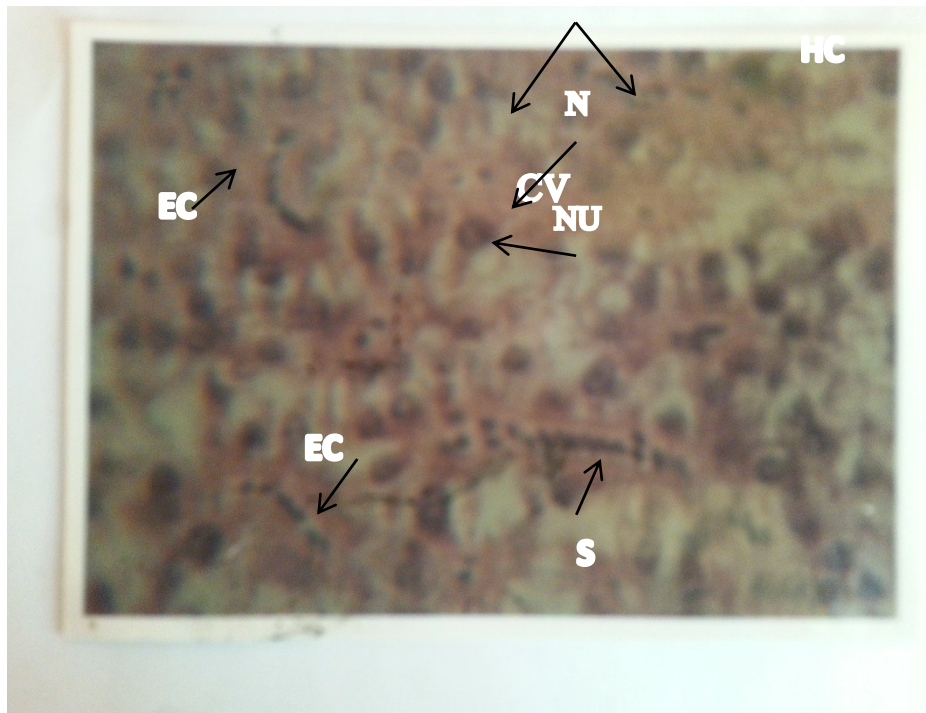


Figure 4:Cross section in liver of adult guppy fish showing Endothelial cells(EC),Nucleus(N),Nucleolus(NU), Sinusoids(S),(H&E,1000x).

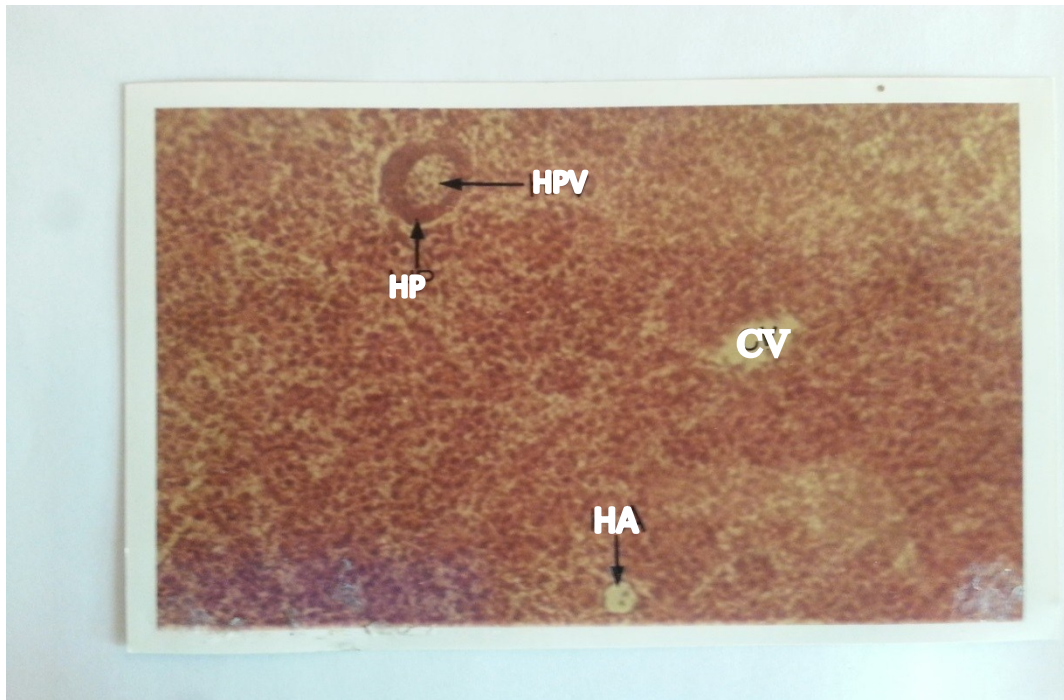


Figure 5: Cross section in liver of adult guppy fish showing Hepatic portal vein ,Hepatic artery(HA),Central vein(CV),Hepatopancreas(HP), (H&E,200x).

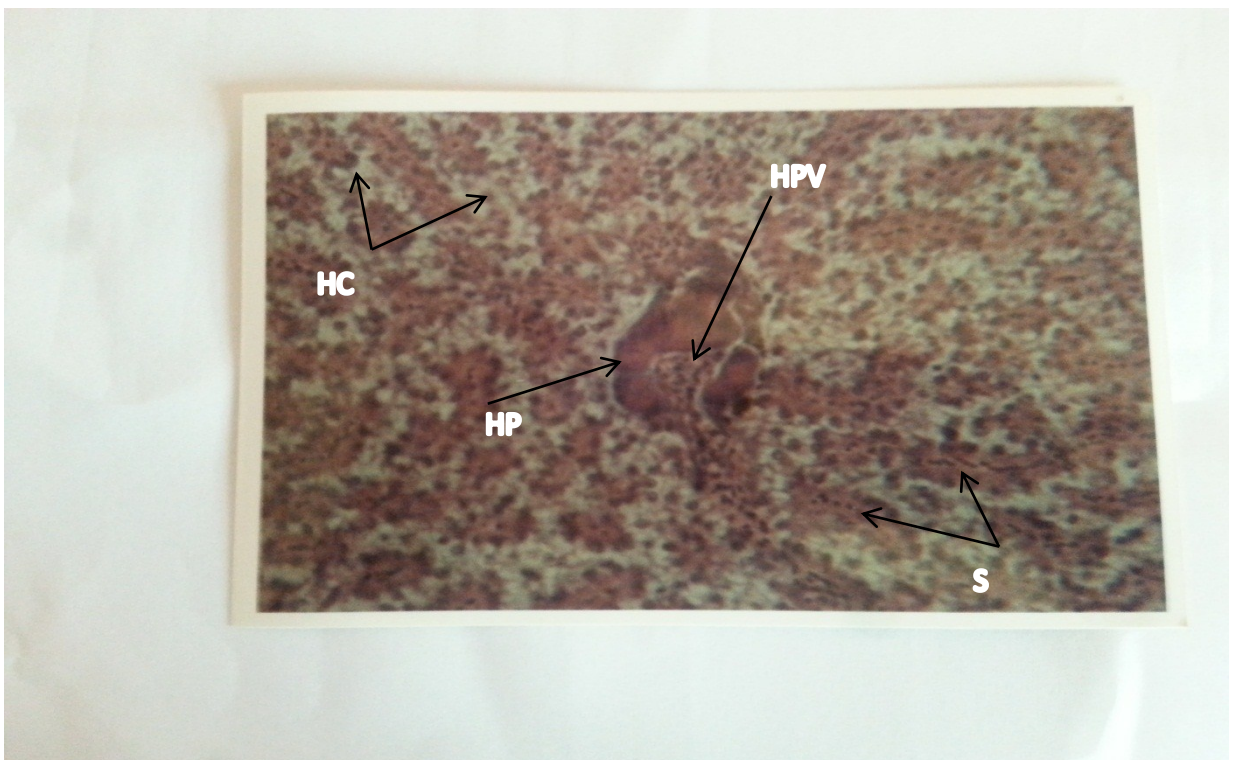


Figure 6: Cross section in liver of adult guppy fish showing Hepatic portal vein(HPV),Hepatopancreas(HP), Hepatic cords (HC), Sinusoids(S),(H&E,400x).



Figure 7: Cross section in liver of adult guppy fish showing Bile duct(BD),(H&E, 1000x).

DISCUSSION

The present study examined the liver of the guppy fish in its morphological and histological structure in the adult fish. The results showed that the liver was a single irregular form, whereas the *Plecoglossus altivelis* was characterized by a single saddle-shaped lobe [7] and in *Esox Lucius* by elongated single lobe [6] and in the *Gasterosteus aculeatus* fish in two lobes [9] and in a fish *Polyodon spathula* with three lobes [10] and in *Cyprinus carpio* with several irregular lobes[11]. This large variation in form and number of liver lobes in different genus and species may be due to the different environmental conditions and genetic structure of the species.

The results of the present study show that the liver of guppy fish lacks the presence of trabeculae which divide its matrix into lobules, These results were consistent with the study of *Gasterosteus aculeatus*[9], *Esox lucius* [6], *Polydon spathula* [10], *Anguilla anguilla* [13]and *Gambusia affinis* [8] and were not consistent with the study of the *Salmo gairdneri* [16] wheres trabeculae consisting of connective tissue arising from the capsule of liver to its matrix to be divided into lobules, and perhaps this variation in the histological structure of the liver of different genus and species was due to the difference of environmental and genetic factors.

The results of this study showed that the matrix of liver was formed from plates or cords of hepatic cells arranged radiating around sections of central veins and were separated from each other by sinusoids, This is contrary to what Mugnaini and Harboe [18] mentioned in their description of the composition of the liver in a fish *Myxine glutinosa* , that the liver substance is arranged by tubules of hepatic cells around bile canaliculi, and hepatic cells of the liver are separated from each other by sinusoids.

The liver in the adult guppy fish did not appear clear portal areas containing triad structures. These triad structures composed of branches of hepatic portal, hepatic artery and bile duct as in mammals [19], This is very similar to the majority of fish that have already been studied [7,9,18,6,10,12,16,13,8], and thus the histological structure of the liver in fish differs somewhat from that in mammals.

Some of the fish had diffuse pancreas, which representing with acini surrounding with hepatic portal vein completely and non completely, these acini penetrates the liver with this vein and its branches were inserted into the liver tissue [20,4,21,8] known as hepatic pancreas [20,21,8], and this was observed when examining the histological sections of the liver of this species of fish.

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