



## Morphology of the liver of the Asian Brown Tortoise (*Manouria emys emys*)

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### ABSTRACT

The liver is located in the intrathoracic part of the abdomen. The bulk of the liver lies to the right of the median plane. The lobation was confirmed as follows; the left lateral and left medial lobes, the caudate lobe and the right lobe. The quadrate lobe could not be observed as in other species. The smaller medial lobe protruded ventrally into the left visceral area. Histologically the liver was characterized by a well developed connective tissue capsule. The lobulation formed by the connective tissue was distinct. The hexagonal lobules were separated from each other by interlobular connective tissue. Each lobule consisted of many hepatocytes, that contained a spherical nucleus in the central region of the cell and were arranged as radiating from the central vein, making up the liver cell cords. In each lobule, the sinusoidal capillaries were concentrated in the direction of the central vein. Endothelial cells made up the wall of the sinusoidal capillaries, where some Kupffer's stellate cells were concentrated.

**Key Words:** Asian Brown Tortoise, Liver, Morphology.

### INTRODUCTION

The liver of the Asian Brown Tortoise shows an extraordinary form and has attracted the interest of many anatomists. *Manouria emys emys*, commonly called as the Asian Brown Tortoise, is distributed from Assam in India, throughout Malaysia to Sumatra and Borneo (King 1996). This study was undertaken to describe the macroscopic and microscopic architecture of the Asian Brown Tortoise liver and to establish a base line data which will be of great value from forensic point of view.

### MATERIAL AND METHODS

A female Asian Brown Tortoise (*Manouria emys emys*) was obtained from Aizawl state Zoo, Mizoram. The animal was brought for post mortem examination. The visceral area was dissected and the whole liver was separated from the body. Tissue

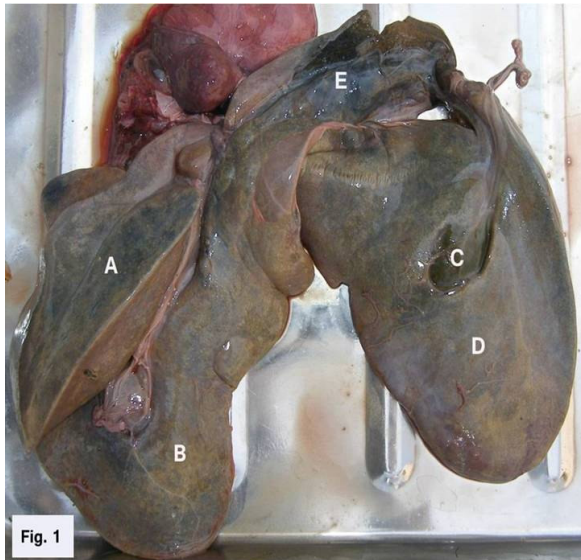
pieces were excised from various parts of the liver and fixed in 10% Phosphate-buffered formalin. After 10 days of fixation, the blocks were dehydrated in ethanol, treated by xylene and embedded in paraffin. The blocks were sectioned at a thickness of 5  $\mu$ , stained with haematoxylin and eosin and the stained sections were observed under light microscope.

### RESULTS AND DISCUSSION

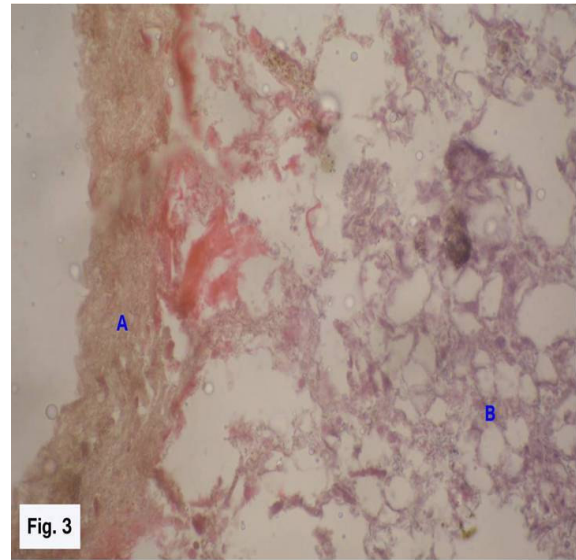
The liver is located in the intrathoracic part of the abdomen. The bulk of the liver lies to the right of the median plane. It has a strongly convex surface towards the heart and a concave surface facing towards the other organs. These two surfaces meet ventrolaterally in a blunt border. The visceral surface of the liver is shown in (Fig. 1). The lobation was confirmed as follows; the left lateral and left medial lobes, the caudate lobe and the right lobe. The quadrate lobe could not be observed as in other species. King (1996) has reported the presence of only left and right lobe in the liver of *Chelonia*. The

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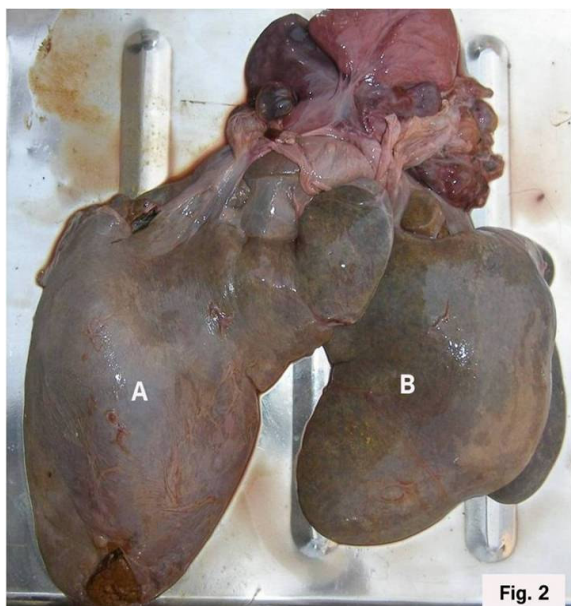
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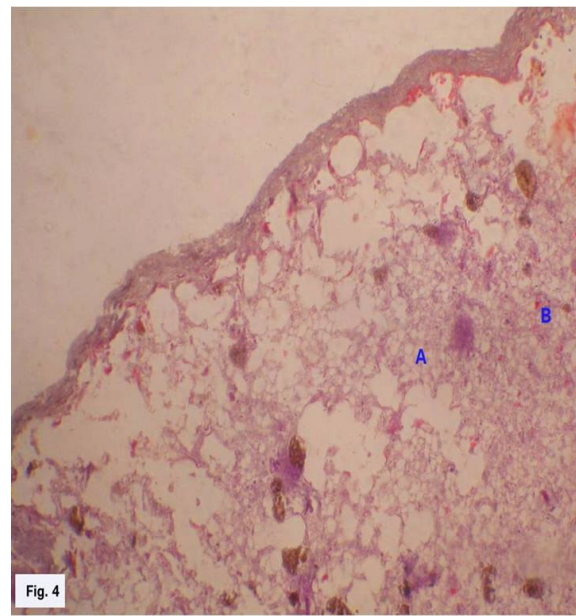
**Fig.1.** The visceral surface of the liver of Asian Brown Tortoise showing; **A.** Left lateral lobe, **B.** Left medial lobe, **C.** Gall bladder, **D.** Right lobe, **E.** Caudate.



**Fig.3.** Liver showing; **A.** Glisson capsule, **B.** Hepatic capsule. Haematoxylin & Eosin (X400)



**Fig. 2.** Parietal surface of Asian Brown Tortoise showing; **A.** Right lobe, **B.** Smaller left medial lobe.



**Fig. 4.** Liver showing; **A.** Hepatocytes, **B.** Stellate macrophages. Haematoxylin & Eosin (X400)

visceral surface is marked by impression caused by the stomach which lies embedded in the left lobe of the liver.

The left lobe was obviously enlarged with respect to the lateral and medial sub-lobes. The left lateral lobe was well developed in the lateral area of the viscera and showed an elongated rectangular shape. The smaller medial lobe protruded ventrally into the left visceral area. In the parietal surface, this lobe appeared sharply triangular in shape (Fig. 2).

The right lobe was the largest one and was well developed, occupying the right and ventral area of the viscera. The lobe showed a curved margin in the ventral area. The gall bladder lies in the visceral surface of the lobe as observed by the Evans, H. E. (1986) in reptiles (Fig. 1).

The caudate lobe represented a long triangular protrusion into the visceral area of the liver (Fig. 1). Its caudate process was laterally enlarged in the right direction. It was present posterior to the dorsal area of the right lobe.

The parietal surface was smoothly curved. In this aspect, the right lobe occupied the largest area. The two left lobes could be identified; however the caudate lobe could not be demonstrated in the parietal position.

The notches were observed especially in the visceral and the ventral side of each lobe. The left part of the dorsal margin carries the impression of the esophagus.

Microscopically the liver was characterized by a well developed connective tissue capsule (Fig 3). Histologically, the lobulation formed by the connective tissue was distinct (Fig. 3). The hexagonal lobules were separated from each other

by interlobular connective tissue. Each lobule consisted of many hepatocytes (Fig. 4), that contained a spherical nucleus in the central region of the cell & were arranged as radiating from the central vein, making up the liver cell cords. In each lobule, the sinusoidal capillaries were concentrated in the direction of the central vein. Endothelial cells made up the wall of the sinusoidal capillaries, where some Kupffer's (stellate macrophages) cells were concentrated (Fig. 4). The system of interlobular arteries, veins and bile ducts were clearly seen within the interlobular connective tissue. The bile duct wall consisted of the columnar cells. The wall of the arteries was thick, and two or three cell layers could be observed, whereas a large lumen and a thin endothelium characterized the wall of the interlobular veins. These findings were similar in all the different parts of the liver, so we suggest that this liver structure is peculiar to Asian Brown Tortoise. Literature pertaining to the histology of the Asian Brown Tortoise could not be found for discussion.

## REFERENCES

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