

## HISTOLOGICAL OBSERVATIONS ON THE KIDNEYS OF INDIAN BLACK IBIS (*Pseudibis papillosa Temminck*)

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**Abstract:** The present histological observation was carried out on 3 Indian Black Ibis birds. The kidney tissue samples were processed and stained for histological study. The left and right kidneys of Indian Black ibis (*Pseudibis papillosa*) consisted of three lobes viz. cranial, middle and caudal. The kidney of Indian black Ibis is divided into distinct cortex and medulla, covered by a thick outer capsule under microscope. Larger cortex areas are shared by a small common medullary zone. The cortical areas are elongated and oval shaped. A central vein in the cortex was surrounded by closely packed components of nephrons along with renal corpuscles. Three types of renal corpuscles viz. reptilian (with no loop of Henle), intermediate and mammalian (looped nephrons) were observed. The renal medulla is small cone shaped covered with very thin outer connective tissue sheath. Thick and thin segments of Henle's loops were scattered in the medulla. The thick segments are distributed close to the central areas of medulla along with medullary collecting ducts, whereas the thin segments are distributed at the periphery of the medulla.

**Keywords:** Histology, Kidney, Nephron, Ibis.

### Introduction

The Indian black Ibis is a water bird and migratory in nature. They belong to *Threskiornithidae* family. Their population is distributed in India and the countries which borders the India. The adult bird is medium in size about 60 to 70 cm length and with red wart in the head region. Juvenile birds lacks red wart in the head. The bill of adult birds are long and curved whereas the bill of younger ones are shorter and not curved. Presence of Ibis in farm areas adds the agricultural income to farmers by eradicating lot of insects by preying them. So they are also known as Farmers friend. It also inhabits dry areas and feeds what is available there (Williams and Ward, 2006).

The kidneys of birds are flattened elongated organs located in iliac fossa of synsacrum and each one is divided into three lobes; cranial, middle and caudal lobes. The lobes are histologically divided into lobules. The main component of the lobules are cortex and medulla. The functional unit of the kidney are nephrons. There is a difference in nephron structure among reptiles, birds and mammals. The available literatures are all centered only

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on the histology of domestic animals and birds. The detailed histology on most of the avian species are yet to be studied. Therefore the current study on the histology of kidneys of this migratory water bird, Indian black ibis was proposed.

### **Materials and methods**

The present histological observation on Indian Black Ibis was conducted at the Department of Veterinary Anatomy, Veterinary College and Research Institute, Tirunelveli – 627 358. Three birds of this study were collected from local markets. The lobes of kidneys were dissected out of synsacral ilac fossa. The tissue samples were fixed in 10% Neutral buffered formalin and Bouin's fluid and processed for histological studies as per Bancroft and Stevens (2013). The tissues were dehydrated using ascending grades of alcohol, cleared in xylene and embedded in paraffin wax for preparing the paraffin blocks. The blocks were sectioned at 5 to 7  $\mu$  thickness using semi-automatic rotary microtome (Leica). The sectioned tissue slides were stained in Haematoxylin and Eosin (Bancroft and Stevens, 2013) and Masson's Trichrome method for collagen and muscle fibres (Luna, 1968).

### **Results and discussion**

The left and right kidneys of Indian Black ibis (*Pseudibis papillosa*) consisted of three lobes viz. cranial, middle and caudal. The histological observations revealed that the kidney of Indian black Ibis is divided into distinct cortex and medulla, covered by a thick outer capsule which contains more collagenous fibres along with smooth muscle tissue. Connective tissue fibres extended from capsule and found to entered into the renal parenchyma. Larger cortex areas shared by a small common medullary zone. Renal medulla appeared as an elongated and cone shaped as also observed by Nabipour (2009). The interstitial tissue with few collagen fibres and protoplasmic fibroblasts were noticed in the renal parenchyma.

The corical areas are closely packed with renal corpuscles, proximal convoluted tubules, distal convoluted tubules and collecting ducts (Fig.1). Histologically the renal corpuscle consist of central glomerulus surrounded by Bowmans capsule. the Bowmans capsule consist of parietal layer and visceral layer. The parietal layer was outer layer of the capsule lined with simple squamous epithelium. Whereas the visceral layer was found close with glomerulus. Between the parietal layer and visceral layer there is a space called urinary space. Mesangial cells are more and distributed in between the glomerular capillaries.

The proximal convoluted tubules were seen as rounded cross sectioned elements lined by cuboidal cells with central narrow lumen showing distinct brush border as also seen in kidneys of Quail and green winged Teal (Baragoth, 2015). These tubules were lined with

cuboidal epithelium with their nuclei located in the lower half of the cells. The distal convoluted tubules are less elongated oval tubules, lined by simple cuboidal epithelium. They lack brush border and possess wide luminal space. This is in agreement with Nabipour (2009) who observed that the proximal and distal convoluted tubules in collard dove and owl kidneys consisted of a cuboidal epithelium and the luminal surface area of the proximal convoluted tubules enhanced by a thick layer of brush borders. The cortical collecting ducts are elongated tubules mostly seen at the periphery of the cortex lined by cuboidal epithelium. A central vein in the cortex was surrounded by closely packed tubular components of nephrons along with renal corpuscles (Fig.1). This pattern of arrangement resembled the lobular pattern of liver. The cortical nephrons were distributed more in the peripheral cortex. Whereas the medullary nephrons were larger and few in number, situated in close with that of the medullary cones. This statement is similar as reported by Deef (2015) in Coot and lesser Moorhen birds. The cortical nephrons were smaller in size than the medullary nephrons. Both cortical and medullary renal corpuscle was round in shape.

The classification based on structural and functional status of the renal corpuscles and tubules revealed three types in these birds viz. reptilian (with no loop of Henle), intermediate and mammalian (looped nephrons) type (Fig.2) as also reported by Hodges (1974) in fowl; Mclelland (1990) in avian species and Dyaa et al (2014) in Harrier, Chicken and Mallard ducks. In the current study the reptilian type nephrons are numerous in the subcortical region of the kidney. The intermediate and mammalian types are evenly distributed in the cortical and juxta-medullary regions. The presence of both mammalian and reptilian types of nephrons suggested that this type of migratory birds which watered on sea water required more of reptilian type of nephrons responsible for limiting urine concentration in order to excrete more of salt.

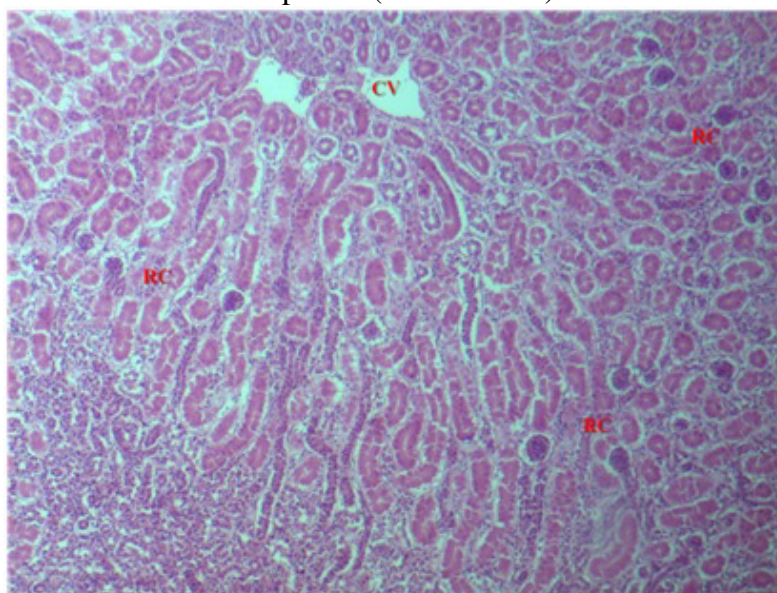
The renal medulla is small cone shaped covered with very thin outer connective tissue sheath. Thick and thin segments of Henle's loops were scattered in the medulla. The thick segments are distributed close to the central areas of medulla along with medullary collecting ducts, whereas the thin segments are distributed at the periphery of the medulla (Fig.3).

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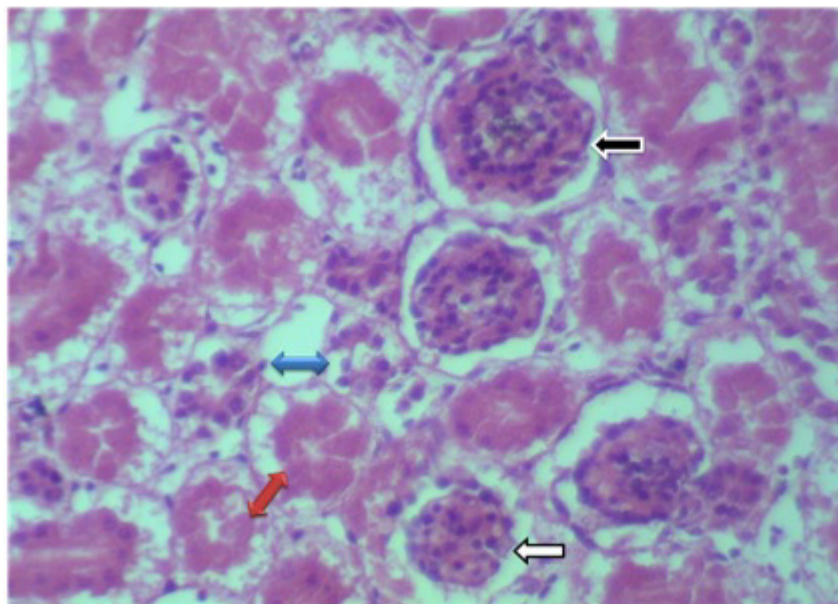
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**Figure 1.** Photomicrograph of the cortex of kidney. CV – Central Vein, RC – Renal Corpuscle (H& E X 100)



**Figure 2.** Photomicrograph showing renal corpuscles and tubular elements. Black Arrow – Mammalian type renal corpuscle, White Arrow – Intermediate renal corpuscle, Red Arrow – Proximal convoluted tubules, Blue arrow – Distal convoluted tubules (H& E X 400)



**Figure 3.** Photomicrograph of the medulla showing arrangements of tubules of Nephrons. CT – Medullary Collecting tubule, Tk – Thick segment, Tn – Thin segment (H& E X 400)

