

## Histological Study of Esophagus in White Breasted Kingfisher (Halcyon symernensis)

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دراسة نسيجية للمريء في طائر صياد السمك الرفراف ابيض الصدر

**Halcyon symernensis**

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### المستخلص

تهدف هذه الدراسة توضيح المظاهر المجهرية لتركيب المريء في طائر الرفراف ابيض الصدر الملقب ب (صياد السمك) الذي يعتبر احد الطيور البرية آكلات اللحوم من خلال دراسة التحورات النسيجية من تطور طيات الطبقة المخاطية للمريء والغدد الفارزة للمخاط وكذلك الكتل العضلية المرتبطة بعادات التغذية الخاصة بطائر الرفراف. أجريت الدراسة النسيجية على عشرة طيور بالغة سليمة خلال الفترة من آذار الى شهر أيار من عام ٢٠١٦ في البيت الحيواني لكلية العلوم/ جامعة واسط . أظهرت النتائج ان مريء طائر الرفراف يتميز بكونه انبوبة عضلية رقيقة مرنة. وان اهم ما يميز تركيب المريء في طائر الرفراف نسيجيا ان جدار المريء وجد ان يتكون من ثلاث طبقات او غلالات فقط : مخاطية، عضلية وبرانية مرتبة من الداخل الى الخارج مشيرا الى غياب الطبقة تحت مخاطية . اظهر الفحص المجهرى للطبقة او الغلالة الاولى (المخاطية ) لجدار مريء طائر الرفراف انها مكونة من صفيحة اصيلة وطلائية مع وجود مجموعة من طيات طولية دون تمييز للمخاطية العضلية. بطنت الطبقة المخاطية للمريء بطلائية من نوع مطبق حرشفي غير متقرن. اما الصفيحة الاصيلية للطبقة المخاطية ف لوحظ انها مكونة من مجموعة من غدد مخاطية مريئية. كما اشارت دراسة التراكيب المجهرية لجدار المريء اختفاء الطبقة تحت المخاطية بسبب صعوبة تمييزها عن الصفيحة الاصيلية. اما الغلالة الثانية وهي الغلالة العضلية الخارجية فتكونت من الياف عضلية ملساء مرتبة بطبقتين ثانويتين، داخلية مرتبة بصورة دائرية وخارجية مرتبة بصورة طولية. إضافة الى الطبقات المذكورة وجدت طبقة ثالثة اخيرة تحيط بالعضلية الخارجية تكونت من الياف عصبية وخلايا دهنية عرفت بالبرانية.

## Absrtact

Study targeted to clarification the microscopic features of the esophagus structure in (white breasted kingfisher) bird *Halcyon smyrnensis*, which is primarily piscivorous, through studying of various histological modifications such as relative development of mucosal folds, mucous-secreting glands and musculature have been shown to be correlated with the specific feeding habits of studying bird. Histological study was conducted on ten adult healthy birds during the period from March to May of 2016 in the Animal House of the College of Science / University of Wasit. The results showed that the esophagus kingfisher birds characterized as a thin flexible muscular tube. The most important characteristic of the installation of the esophagus in a bird Kingfisher histologically that the wall of the esophagus found to be composed of only three layers or tunics: mucous, muscular and adventitious arranged from the inside to outside, referring to the absence of tunica submucosa. Microscopic observation of first mucosal layer of esophageal wall showed that it was consists of lamina propria, epithelia and groups of longitudinal folds without discrimination for presence of muscularis mucosae.

Mucosal layer of esophagus wall lined by epithelium of non- keratinized stratified squamous epithelium tissue. Lamina propria noticed to compose of numerous mucous esophageal glands. The histological study of esophageal wall also indicated to the absence of submucosa layer because the difficulty to distinguish from the lamina propria. The second tunica tunica a muscularis externa composed of smooth muscle fibers arranged into two secondary layers, inner circular layer and an outer longitudinal layer. In addition to the mentioned tunics it's found a third layer surrounding the muscularis externa consisted of nerve fibers, and fatty cells known adventitia.

## Introduction

The digestive system in birds composed of buccal cavity, pharynx, esophagus, proventriculus, gizzard, small and large intestine and cloaca (5, 6). Clear variation found in avian digestive

tract according to the type of ingested food (7). The avian wall of digestive tract is composed mainly of four basis layers arranged from inner to outer, mucosa, submucosa, muscularis externa

and Serosa or Adventitia (8). There is some variations in the microscopic structure and also thickness of these layers according to types of birds also types of ingested food (9,10).

The esophagus in birds was passage for the food (11). The avian esophagus is long distensible tube connect the oropharynx and the proventriculus. It lies on the right side of the neck dorsally to the trachea. Immediately cranial to the thoracic entrance the esophagus returns to the median line and expand ventrally to form the crop (12). The esophageal wall of the chicken consists of four tunicae: mucosa, sub mucosa, muscularis and adventitia (13). The epithelium of esophagus mucosa was a non-keratinized stratified squamous. The lamina propria was a loose connective tissue containing numbers of glands. Glands were either purely mucous or seromucous (14). The muscularis mucosa was presented as a thin layer of smooth muscle fibers (15). Tunica submucosa was a loose connective tissue containing vessels and nerves (16). The tunica muscularis externae composed of smooth muscle and was surrounded by the tunica adventitia at the cervical part of the esophagus and crop, and by the

tunica serosa at the thoracic part of the esophagus (17).

The white-breasted kingfisher (*Halcyon smyrnensis*) is a tree kingfisher, It's widely distributed in Asia from Turkey east through the Indian subcontinent to the Philippines (1). In Iraq, this kingfisher observed presence in the south and center of Iraq's cities, especially in the marshlands, Where scored the existence of this bird in a survey for birds society at Abu-Zerik marsh, South of Iraq (2). This kingfisher is a resident over much of its range, although some populations may make short distance movements. It can often be found well away from water where it feeds on a wide range of prey that includes small reptiles, amphibians, crabs, small rodents and even birds (3). It is a common species of a variety of habitats, mostly open country in the plains with trees, wires or other perches. The range of the species is expanding (4).

Due to the difficulty in obtaining wild birds and their nests detected there are lack of histological and anatomical studies on the side of wild birds in Iraq, especially white breasted kingfisher birds so this work was done to cover even a few descriptive structures side

pane for the esophagus as a part of digestive system.

## Materials & Methods

A total of ten wild healthy adult kingfisher were collected by hunting from different areas of Wasit province during the period from March to May of 2016, putted in separated cleaned cages in the Animal House of the College of Science / University of Wasit. Birds putting under surveillance in control circumstances to choose the healthy grouped, then anesthetized by chloroform and autopsied immediately after anesthesia. The esophagus was dissected and washed several times with normal saline (0,9%) solution, Then cutting different regions of each part of

esophagus and fixed by putting in 10% formalin and boun's solution for 72 hours at room temperature. Specimens treated by routine histological processing. The specimens were embedding with paraffin wax (58-60 C<sup>0</sup>) and sectioning to 5-7µm (18). Then staining by Harries Hematoxylin and Eosin (H&E) stain for demonstrating the general histological components (19). Sections were examined in Meiji microscope, pictured by Japan digital canon camera.

## Results

The esophagus of kingfisher communicates anteriorly with the pharynx and pass posteriorly between the bronchi to link the proventriculus.

Primarily three tunics constitute the structure of esophagus, a mucosa that lining with stratified squamous epithelium and lamina propria, There is no muscularis mucosae (fig. 1, 2). The submucosa layer can't differentiate from

the lamina propria (1, 3). Observation also shows muscularis externae composed of smooth muscle fibers arranged as inner longitudinal and outer circular, and finally there is adventitia layer (fig. 3, 5).

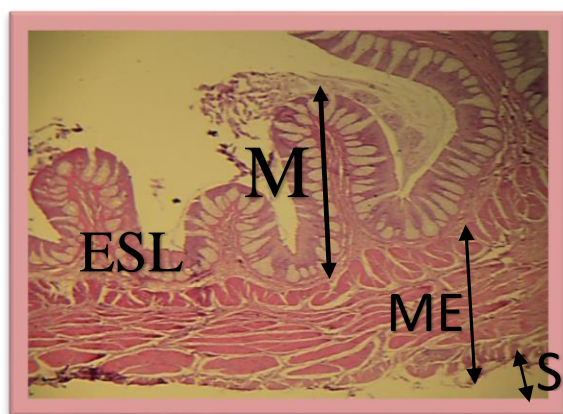
Simple oval glands were situated almost entirely within the epithelium wall and just extending to the lamina (fig. 2, 3, and 4). The basal glands and

excretory duct were composed of similar cells with slight variations occurring in excretory duct lengths (fig. 4).

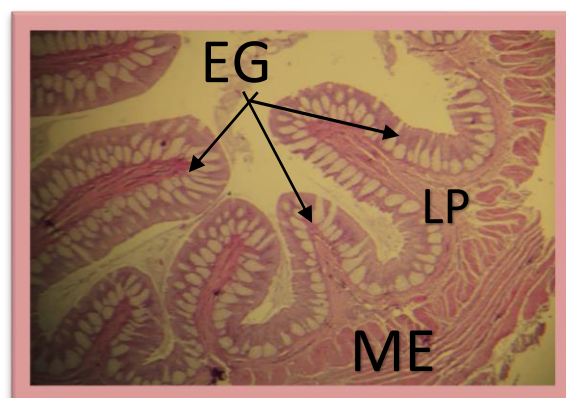
Microscopic examination observes smooth muscle fibers of tunica muscularis externae arranged in two layers, inner longitudinal and outer circular (fig. 2, 3, 6). Results shows that outer circular layer was thicker than inner longitudinal (fig. 6). In cross

section the muscle cells appears in different size and shape packed within a bundle and enclosed by connective tissue sheath (fig. 6).

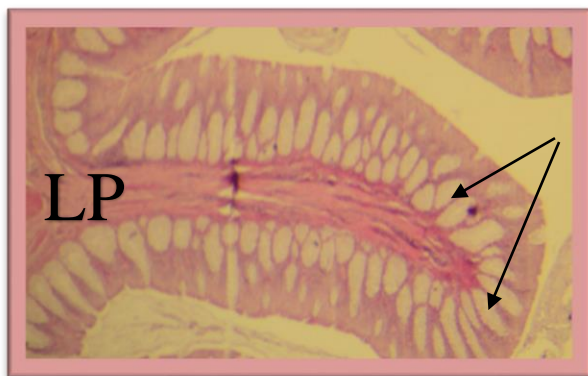
Finally tunica adventitia that marks enveloping the entire tube. At interval in the adventitia, ganglia and nerve fibers observe supplying the esophageal tube (fig. 7).



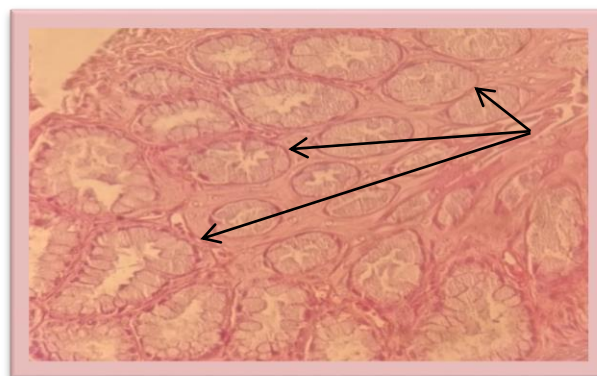
**Figure (1):** cross section Esophagus of kingfisher shows the three layers, Mucosa (M), muscularis externae (ME) and serosa (S), (H&E 4x ).



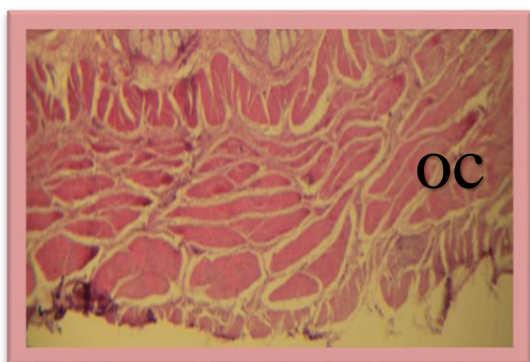
**Figure (2):** Photomicrography of the esophageal wall in kingfisher shows mucosa layer shows the epithelium, lamina propria (LP) and esophageal glands (EG). H&E, 10x



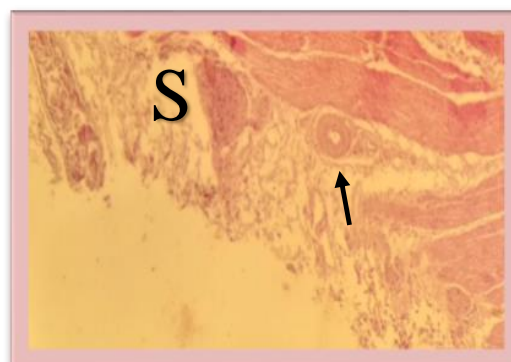
**Figure (3):** Photomicrography of the mucosal esophagus shows longitudinal fold, lamina propria (LP), mucosal esophagus glands (arrow). H&E stain, 400x



**Figure (4):** Photomicrography of esophageal mucosa shows groups of mucosal esophageal glands (arrows) (H&E stain), 400 X



**Figure (5):** Longitudinal section of esophageal Kingfisher muscularis externa (ME) shows inner longitudinal (IL) and outer circular (OC). H&E 400x



**Figure (6):** Photomicrography of cross section esophageal wall in kingfisher shows, Serosa (S), Artery (arrow) (H&E stain), 200 X.



## Discussion

The present study revealed the esophagus of white breasted kingfisher is long muscular tube located in right side of the neck between the oropharynx and proventriculus which agree with (12) on his study of *Columba livia domestica*. Antique or non-existent crop graminivorous (20, 21). In studying bird, that is not form crop which agree with (22, 23) on his study on in rheas and captive bustards respectively, While disagreement with (24), who's found that it expended to form the crop in Grey-Backed Shrike.

Histological observation shows that the esophagus wall of kingfisher consists of three layers: mucosa, muscular layer and adventitia. Submucosa layer was absent. The result was agreed with (2) who study Geese and (25) in his study on Grey-Backed Shrike and also agree with (22) in Japanese quails. While, disagreement with (12, 8) in *Lorasmelono cephalus* and homing

pigeon respectively whose observes submucosa layers consist on connective tissue, these results due to the variations of food between these birds and kingfisher.

Mucosa layer composed of stratified squamous epithelium that contain mucosal folds and lamina propria with numerous simple oval mucus glands that agree with (23) on studying marabou stork. muscularis mucosae was absent which disagree with (2,24) on Geese and Laughing Dove respectively.

Two layers of muscularis mucosa inner longitudinal and outer circular agree with (12, 8, and 24) on study *Columba livia* and *Lorasmelomocephalus* and *Streptopelia senegalensis* respectively. But disagreed with (12, 25, 26) said that inner layer was circular and outer longitudinal which disagreed with this study. (30, 31) said that final adventitia layer of esophageal tube which composed from loose connective, collagen and elastic fibrous So, the result of this work about this layer was agreed with them.

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