

Microscopic Study on the Tongue of Male Ostrich

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Abstract: The tongue of the birds is located in the caudal portion of the oral cavity and contains many salivary glands in most of its parts. It is of different shapes. Sixty tongues of the ostrich were collected, the length of it were measured. Routine paraffin sectioning with special staining method was done. Our results manifested that the salivary glands are mostly simply branched tubulo-alveolar, but all have mucous secretion that open on surface of epithelium. There is no papillae on the surface of tongue, but it has a rough surface. The dorsal and ventral surfaces of tongue are covered by nonkeratinized stratified squamous epithelium. The tongue contained many lingual salivary glands in its dorsal and ventral surfaces and contains unpaired intraglossal bone. Glands are in form of large lobule on the ventral surface of the base of tongue, while as in the form of small lobules on its dorsal surface.

Key words: Tongue • Salivary gland • Ostrich

INTRODUCTION

The tongue is rooted in the pharynx and developmentally has a pharyngeal origin, although the greater part of its substance lies within the buccal cavity [1]. Some literature that were conducted on the tongue in birds such as the ultrastructure of the salivary glands in the midtongue of the common vampire bat [2], morphology of beak and tongue in partridge [3], fine structure of the tongue and lingual papillae in penguin [4], ultrastructural study of the keratinization of the dorsal epithelium of tongue in goose [5], histological and histochemical studies on the lingual, preglottal and laryngeal salivary glands in Japanese quail [6], light and scanning electron microscopic study of the tongue in the white tailed eagle [7] and microscopic study of the tongue in cormorant [8]. No information is available concerning histological study of the tongue in the ostrich, thus this study described their morphological features.

MATERIALS AND METHODS

Six heads from healthy adult male ostriches (1.5-2 years old), immediately after killing, were collected from

slaughterhouse. All the heads were cut off at the level of the second cervical vertebra. A piece of wood was put between the upper and lower beaks and then the samples were kept submerged in 10% formalin for 72 h. To open the mouth cavity wider, the beak's angles were incised. Then, anatomical position and shape of the tongue were studied in details. Tongues with frenulum were cut off. They were divided into many parts. After complete fixation, the species were transferred into autotechnikon. Then sections with thickness of 6 micron were obtained. Staining with haematoxylin eosin for studying of general microstructure of the tongue, Masson's trichrome for collagen bundle, Alcian blue and periodic acid Schiff for staining of acidic and neutral mucopolysaccharides were used. The sections were studied by Zeiss photomicroscope and prepared photomicrograph.

RESULTS

This study revealed that the tongue in ostrich is semicircular, short and quite thick with 1.92 ± 0.15 cm length and $2.92 \text{ cm} \pm 0.29$ cm width. It contains the unpaired broad intraglossal bone which articulates with the basihyoid bone, a blunt round apex, base and a body.

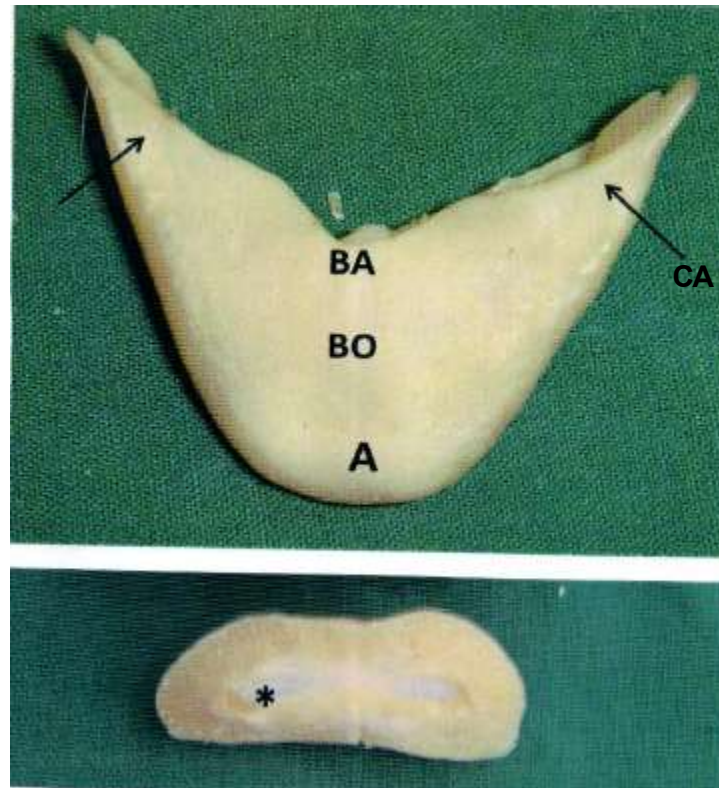


Fig. 1: The tongue of adult male ostrich

A. Apex BA.Base BO.Body CA.Caudal process * Entoglossal bone

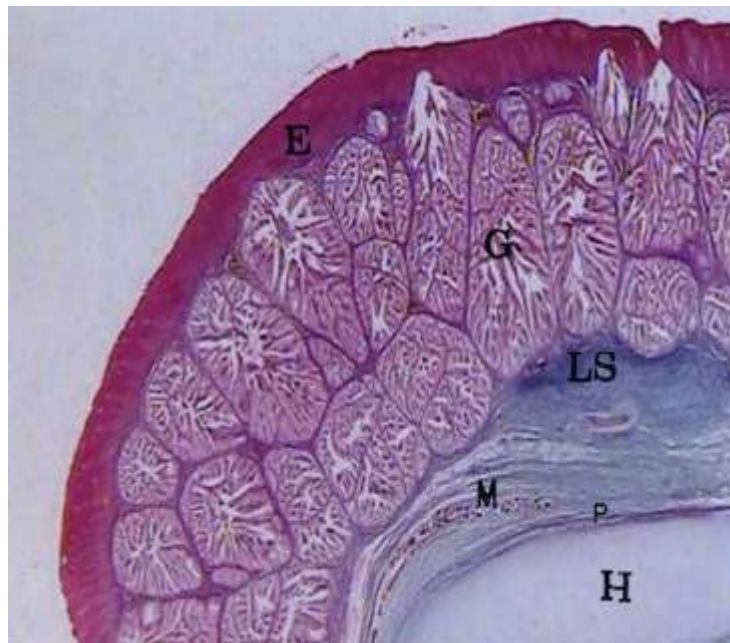


Fig. 2: Photomicrograph of the apex of the tongue in adult male ostrich the green masson's trichrome ($\times 20.6$).

E. The epithelium of the dorsal surface LS. Lamina propria and submucosa
 P. Perichondrium G.The mucous simple branched tubulo-alveolei glands
 M. Striated muscle H. Endocartilaginous ossification of the entoglossal bone

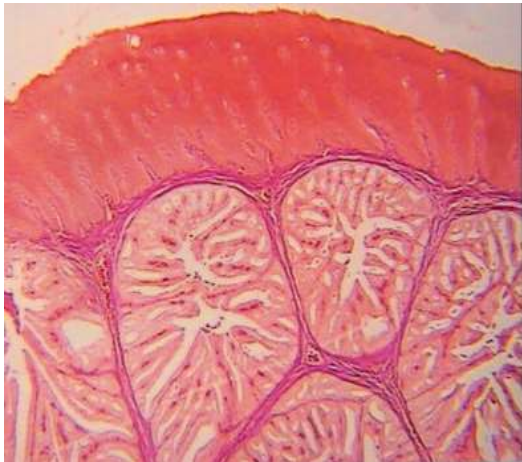


Fig. 3: Photomicrograph of the part of the apex of the tongue showing simple branched tubulo-alveoli green masson's trichrome ($\times 45$).

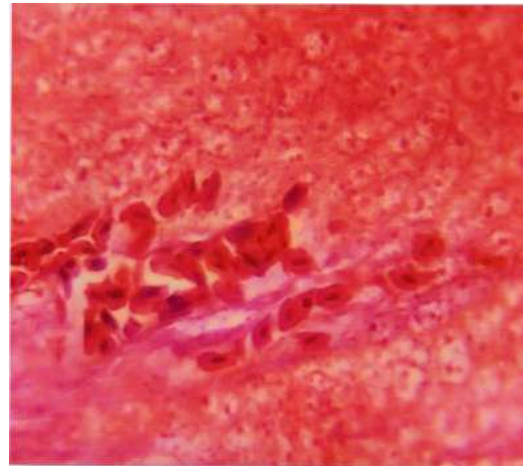


Fig. 4: The penetration of the blood capillaries showing in the epithelium of the dorsal surface of the adult male ostrich with the green masson's trichrome ($\times 720$).

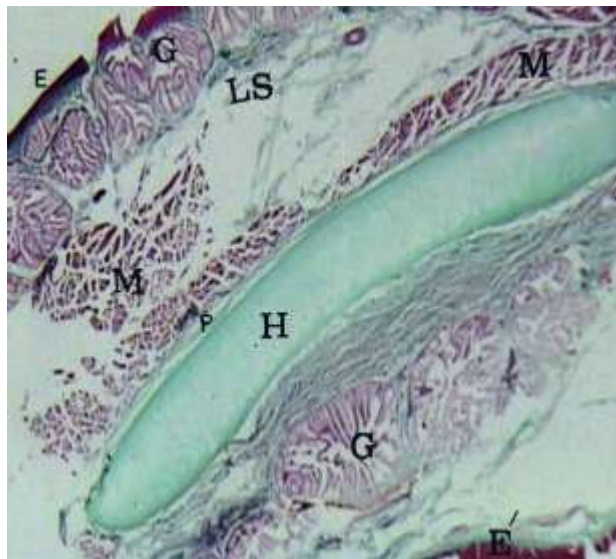


Fig. 5: The photomicrograph of the body of the tongue in adult male ostrich
 E. The epithelium of the dorsal surface
 The epithelium of the ventral surface
 G. Mucous gland
 LS. Lamina propria and submucous
 H. The endochondral ossification of the entoglossal bone M. Striated muscle
 P. Perichondrium

The base consists of a wide v shaped notch and 2 caudal process that extend toward the larynx (Fig.1). It is covered by mucosa and main part of it consists of the striated muscle and glands. The epithelium of the dorsal and ventral surfaces is non-keratinized stratified squamous which is thicker on the dorsal surface. Penetration of many

capillaries was observed on the superficial part of the epithelium (Figs.2,3,4). Lamina propria and submucosa are dense irregular connective tissue, which contain collagen fibres, fibroblast, fat cells and many blood vessels. Mucous secreting glands are simple branched tubulo-alveoli, in the form of group which are lobulated by

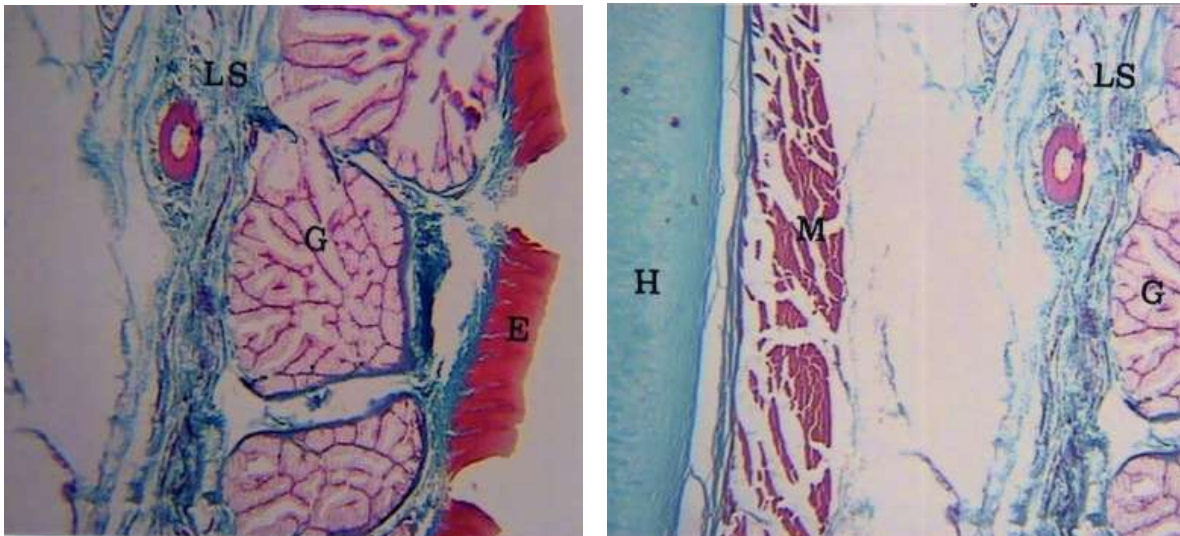


Fig. 6: The photomicrograph of the dorsal surface of the body of the tongue in adult male ostrich green trichrome's masons ($\times 45$).

E. Epithelium of the dorsal surface LS. Lamina propria and submucosa
 G. Lobulated mucous gland M. Striated muscle
 H. Entoglossal cartilage

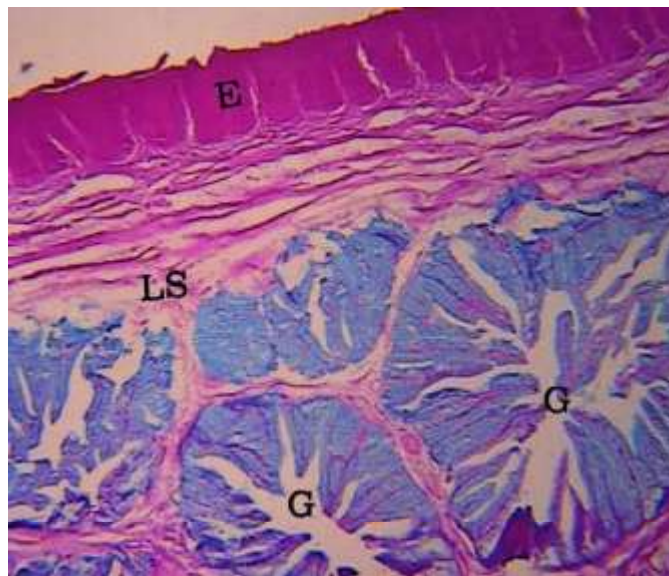


Fig. 7: The photomicrograph of the ventral surface of the body of tongue in the adult male ostrich with alcian blue staining ($\times 45$).

E. Epithelium LS. Lamina propria and submucosa G. Lobulated mucous glands

the septa of the connective tissue. Glands of the dorsal surface of the body occupy the superficial part of the lamina propria and submucosa. But on the ventral surface, glands exist in the deeper part of it. Glands are in form of large lobule on the ventral surface of the base of tongue, while as in the form of small lobules on the dorsal

surface of submucosa, but nonlobulated in the epithelial tissue (Figs. 2, 3, 5, 6, 7, 8). The glands change to simple tubular on the ventral surface of caudal process and present in the lamina propria and exist to the apex of caudal process, but they are simple branched tubulo-alveoli and lobulated in the lamina propria of its dorsal

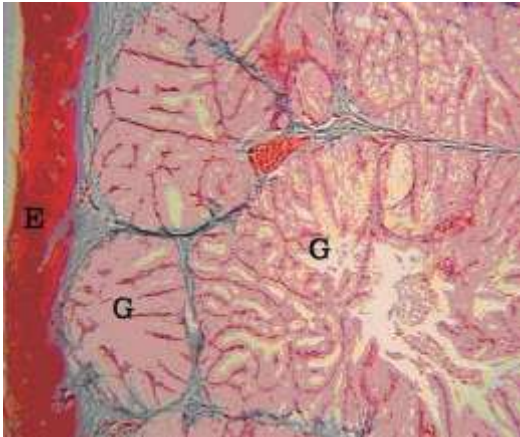


Fig. 8: The photomicrograph of the ventral surface of the base of the tongue in the adult male ostrich with green masson's trichrome staining ($\times 45$).
E. Epithelium
G. Lobulated mucous glands

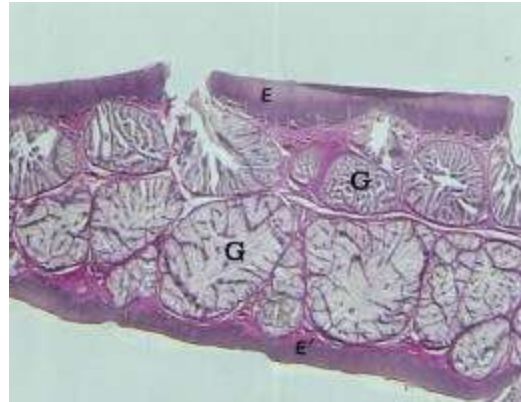
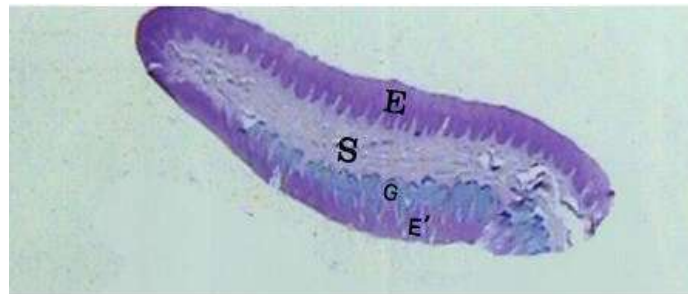


Fig. 9: The photomicrograph of the ventral surface of the base of the tongue in junction with caudal process in the adult male ostrich. Haematoxylin eosin with phloxin staining ($\times 32$).
E. The Epithelium of the dorsal surface
G. Lobulated mucous glands
The epithelium of the ventral surface



($\times 20.6$)

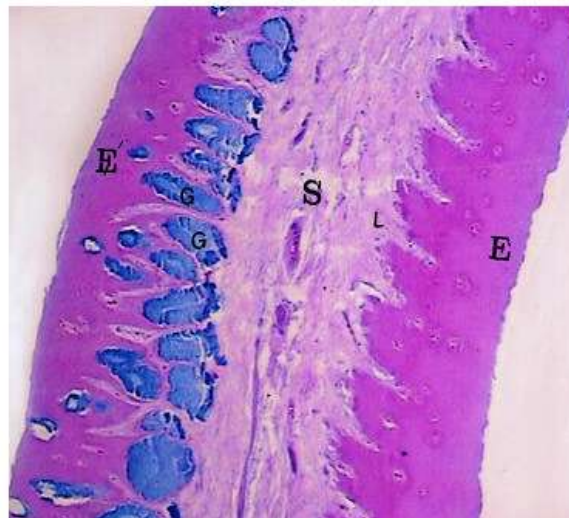


Fig. 10: The photomicrograph of the caudal process of the base of the tongue in the adult male ostrich. Alcian blue staining ($\times 72$).
E. Epithelium of the dorsal surface
L. Lamina propria
E. Epithelium of the ventral surface
S. Submucosal layer
G. Simple tubular gland

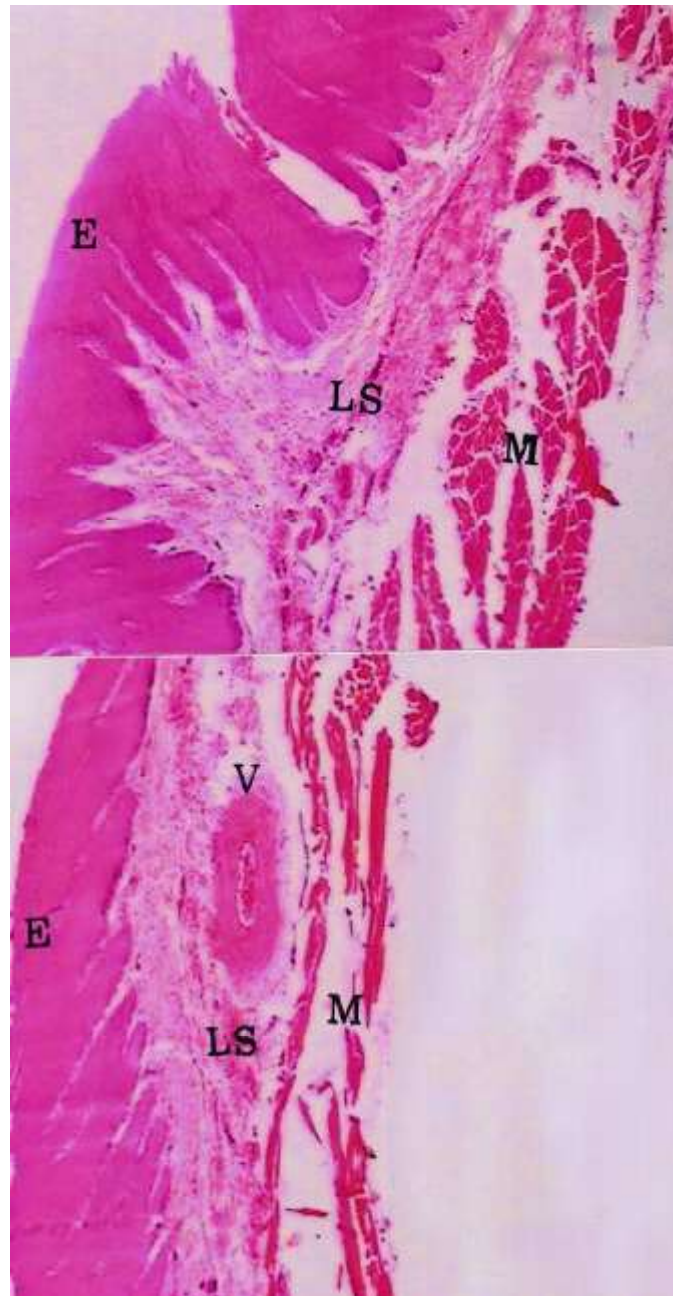


Fig. 11: The photomicrograph of the caudal process of the base of the tongue in the adult male ostrich. Alcian blue staining ($\times 72$).

E. Epithelium of the dorsal surface LS- lamina propria submucosa M- muscle V- vein

surface (Figs. 9&10). There are muscles in the submucosa of the dorsal surface of the tongue. The muscles are arranged thin and striated in the form of circular and longitudinal in the apex. But oriented in the form of circular, longitudinal, oblique in different directions in the base and body of the tongue but, there is no any muscle

in the apical region of the caudal process (Figs. 2,5,6,10). A piece of hyaline cartilage, entoglossal cartilage exists below the muscular layer in the apical and body region of the tongue, ossifying with increasing age. Mucosal fold, stalk like below the tongue is covered by non-keratinized stratified squamous. Lamina propria, submucosa are dense

irregular connective tissue which contain collagen fibers, fibroblasts and blood vessels. This connective tissue is supported by the strong layer of striated muscle which are oriented in longitudinal and circular direction (Figs. 5,6,10,11).

DISCUSSION

It has been shown that the size and shape of the tongue are related to the type of food that the birds eat. In ostrich, the semicircular shaped tongue is covered by non keratinized stratified epithelium. It is devoid of lingual papilla. The Main mass of the tongue is striated muscle which is in the form of two layers in the apex and oriented in different directions in its body and base. It has been observed that a piece of entoglossal cartilage is present in the apex and body of the tongue. In the fowel, the epithelium of the tongue is thick and is stratified squamous. But it is keratinized in the ventral surface and apical region [1]. In the adult chicken, goose and duck, epithelium of the tongue is stratified squamous which is thicker on the dorsal surface and is keratinized on the papilla in the ridges of the dorsal surface and the anterior part of ventral surface [9]. In the cormorant phalacrocoax, the main mass of the dorsal part of the tongue is dense connective tissue and lingual mucosa is covered by a multilayered keratinized epithelium. Collagen bundles are dominant elements in the lamina propria [8] whereas in the duck, all of the epithelium of the dorsal surface is stratified squamous and penetration of connective tissue is observed on it. Also, large conical papilla exist on the body of the tongue and papilla which are highly keratinized [5]. Kobayashi et al [4]. reported that in the penguin, the dorsal surface of tongue is thicker and more keratinized than the ventral surface. Conective tissue contains many blood veseles and nerve fibers and a pair of elongated cartilage with long tendon and a few skeletal muscles are present in the middlepart of the tongue. But, in the partridge, the epithelium of the tongue [4] is stratified squamous and filiform papillae are present on the all the surface of the tongue [4]. The tongue contains hyaline cartilage in all of its length of which fixes the muscles under the cartilage [3]. In the ostrich, the salivary lingual glands are simply branched tubulo-alveolar glands with mucous secretion. There was no any serous cell. morphology of the lingual salivary gland and the kind of secretion in the white tailed eagle is similar to the ostrich. The only difference is in the opening of the glands; the anterior lingual glands open on the posterior

part of the body and posterior lingual glands open on the all surface of the root of the tongue [7]. In chicken, lingual salivary glands are compound tubular, which secrete muocus [10] that is similar to mucous secretion of the ostrich. But, in the Japanese quail, salivary lingual glands are in pairs and are located in the right and left side of The entoglossal cartilage. Lingual salivary glands contain 2 lateral and middle parts. The Cells of the lateral part have round nucleus, but in the middle part they are flat [11]. In the common vampire, the salivary glands are elongated tubular with both mucous and seromucous secretions [2]. In the cormorant phalacrocorax, there is no any salivary glands [8].

ACKNOWLEDGEMENTS

We are grateful to the research council of the shiraz university for providing financial assistance. Special thanks are also given to Mr. Moghisi for technical assistance.

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