

Morphology of the Oropharyngeal Cavity of Northern Pintail (*Anas acuta*)

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Abstract: This work aimed to examine the morphological features of the oropharyngeal cavity of ten adults Northern Pintail (*Anas acuta*) using scanning electron microscopy. Both the upper and the lower beak has lamellae at its lateral sides. The roof of the oropharyngeal cavity consists of hard palate divided into two bilateral parts with a median ridge. The tongue is divided into tip, body and root. Filter feeding apparatus of *Anas acuta* are located at all parts of the tongue. Folds at the lateral parts of the tip of the tongue were observed. Lingual hairs are found in the body of the tongue. Two caudal rows of conical papillae are found at the root of the tongue. Openings of salivary glands are found around glottic opening. These glands helps in rolling and sliding the food towards the esophagus. The anatomical structural characteristics of the oropharynx and tongue of Northern pintail are adaptations to life in the aquatic environment.

Key words: SEM-Tongue • Birds-Ducks

INTRODUCTION

All birds are adapted to their different environments with respect to its food sources. The tongue of birds differ in form and size and this may related to the feeding habits and birds habitats. Earlier work of the morphology of the tongue classified the avian tongues into five functional groups; tongues specialized for collecting food, eating, swallowing, taste and touch and the nest building [1]. The tongue in the duck is fleshy due to the lack of cartilage skeleton and adipose tissue [2]. The median groove characterized the tongue of the white tailed eagle, the duck and the bean goose function in directing the food transport [3,4] Birds that live in water and land such as geese, ducks or swans. The beaks and the tongue help in cutting grass, solid food intake, drinking and filtering water [5-8].

Salivary glands are a characteristic features of the upper digestive tract (tongue, palate and pharynx) of birds [9] Salivary glands are different in general morphology and histochemical composition [10]

The Pintail or Northern Pintail (*Anas acuta*) is a migratory duck with wide geographic distribution. The Pintail feeds by dabbling and upending in shallow water

for plant food mainly in the evening or at night and therefore spends much of the day resting. The aim of this work was to investigate the oropharyngeal cavity features of (*Anas acuta*).

MATERIALS AND METHODS

Ten adults Northern Pintail (*Anas acuta*) were obtained from local markets in Damietta. The birds were sacrificed and the head region were dissected. Gross photographs were captured.

Thesamples of tongues were rinsed with 0.1 M cacodylate buffer (pH 7.4). Specimens bearing lingual papillae were resected and fixed in 2% glutaraldehyde (pH 7.4) with cacodylate buffer for 4-6 hours at 4°C. The samples were then postfixed in 1% cacodylate-buffered osmium tetroxide at room temperature for 3-5 hours, then. dehydrated in an ascending series of ethanol and dried, substituting carbon dioxide for ethanol in a critical-point drying apparatus. The specimens were mounted on metal stubs, coated with gold palladium and examined in a JEOL scanning electron microscopy (SEM) in the EM Unit of Alexandria University, Egypt.

RESULTS

The beak is one of the components of the filter feeding apparatus of Northern Pintali and has a shovel shape and consists of upper and lower beaks. Both upper and lower beak have a hard horny sheath (Fig. 1a, b). There are a double rows of lamellae on the upper and lower beak. The roof of the oropharynx consists of hard palate which is divided into two bilateral parts with lamellae at its edges (Fig. 1c).

The tongue of *Anas acuta* located at the floor of the oropharyngeal cavity. Its divided into apex, body and root. Its apex is shovel shaped. The tongue has a rostral portion modified to form a spoon like structure (lingual nail).

There are a row of bristles on the lateral margin of the tongue(Figs. 2a-c). Several cylindrical papillae arranged at the second third of the tongue. There was a shallow median sulcus along the anterior part of the lingual body and lingual prominence (Fig. 2C).

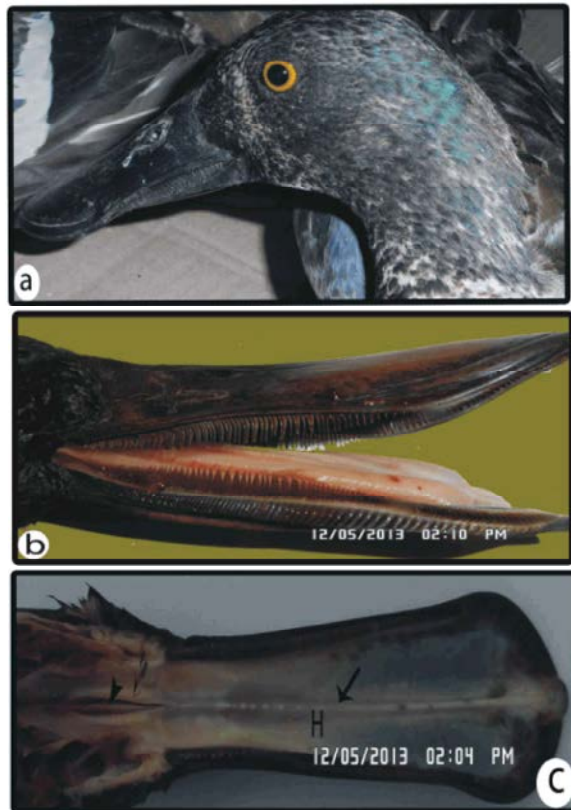


Fig. 1.a: *Anas acuta* b-Lateral view of the oropharynx of *Anas acuta* c-The roof of the oropharynx of *Anas acuta* showing hard palate(H), median palatine ridge(rrow), choanal slit (head arrow).

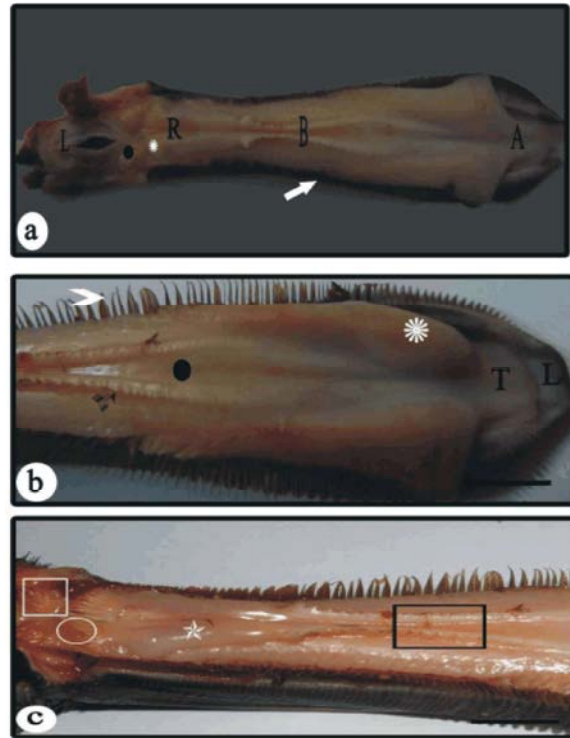


Fig. 2a: Floor of the oropharynx of *Anas acuta* showing tongue tip (A), body(B) and root (R), laryngeal mound (L), bilateral swelling(black circle)b- Tip of the tongue with lingual swelling (white star) and body of the tongue with median ridge (black circle) and a broad horny lingual papillae; lamellae of the lower beak (white arrow)c-Median ridge of the body of the tongue (black rectangle), end of the median ridge with smooth surface (star) bilateral swelling (white square), several pointed papillae (white circle)

Most of the dorsal surface of the tip of the tongue was smooth with small folds at the tip of the tongue and elongated folds at the lateral part(Fig. 3a-c). At a higher magnification, many projections are found (Fig. 3b). longitudinal folds in the inner surface of the tip and circular folds directed inward in the lateral parts of the tongue (Fig. 3d-e).

Median part of the lingual body characterized by the presence of lingual hairs (Fig.4a). Circular cell was observed (Fig.4b). Microprojections were observed at higher magnification (Fig.4c).Small and large microprojections were observed at the tip of the lingual root (Fig. 5a). Only Large microprojections were observed at the middle of the lingual root (Fig. 5b).

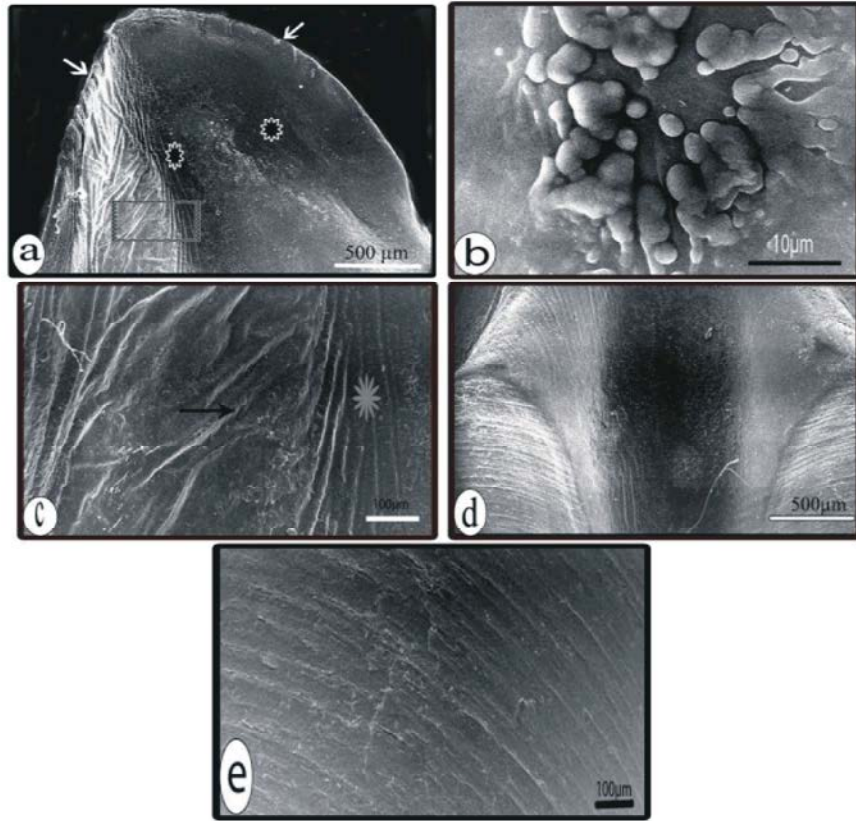


Fig. 3.a: Scanning electron micrograph of Tip of the tongue with small folds at the external part (arrow), depressions at the internal surface) (black star). Folds at the lateral part of the tongue(rectangle). b-Well developed microprojectionsat the lateral part of the tongue.c.longitudinal folds directed to the middle of the tongue(white star)and laterally (black arrow). D- Groove at the end of the tongue tip.e-circular folds at the lateral part of the tip.

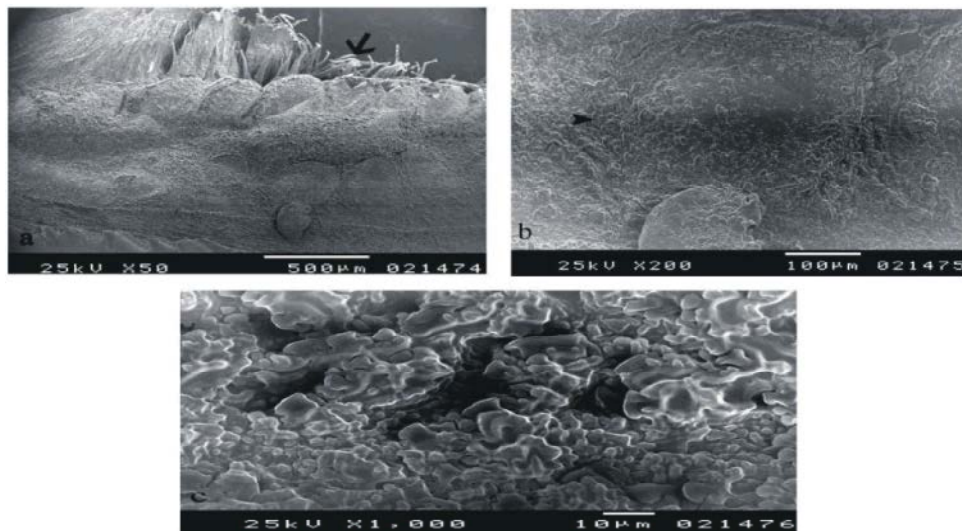


Fig. 4: a-Scanning electron micrograph of of the lingual body. showing Lingual hairs (arrow) found at the median part b- demarcated circular cell margin (arrow) at the lingual body. c-Microprojections at the surface of the lingual body

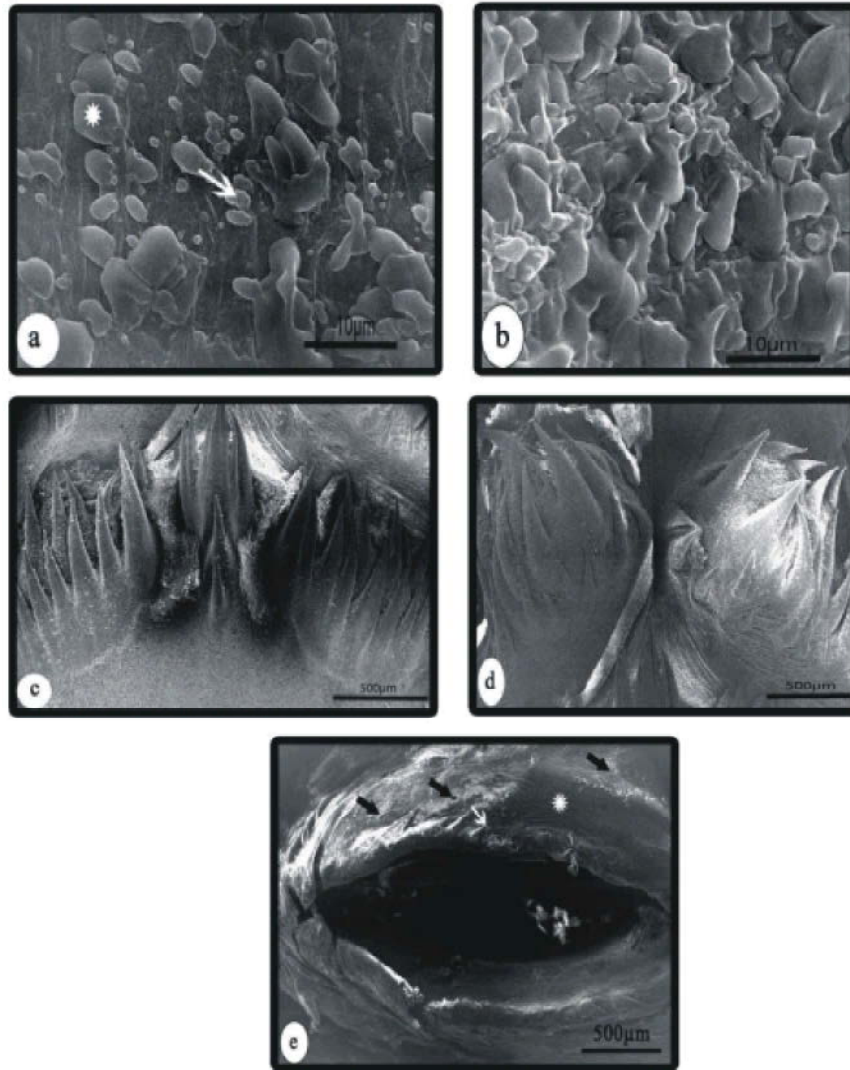


Fig. 5: a- Scanning electron micrograph of the anterior of the root of the tongue showing Small and large Microprojection at e.b-Large microprojections at the middle of the root of the tongue.c.two caudal rows of conical papillae.d- two bilateral mucosal swellings in front of glottis.e- Glottic opening with folded epithelium(white star), conical papillae (white arrow) and opening of salivary glands (black arrow)

DISCUSSION

The shape of the tongue is closely related to different eating habits, life styles and habitats. The tongue is elongated and oval in water birds e.g. duck and goose [3,11,12], starry in emu [13] and lance shaped in wood pecker [14].

Choanal slit is a single cavity (communication between nasal cavities and the oropharyngeal cavity).demarcated from the hard palate by a transverse ridges. Its lumen is separated into two compartments by a median ridge similar.

Four types of food intake called grazing, pecking, drinking and filter feeding are used in Anseriformes. Anatinae and Anserinae family differ in food transportation. Anatinae feeds ranges from grains and plants to bivalves, other mollusks and fish [7].

Anserinae such as the goose and the swan feed on the vegetative parts of plants. Geese are more adapted to the terrestrial style of life than to the aquatic one and are non specialist filter feeders [7].

The rostral portion of the tongue in Northern Pintail (*Anas acuta*) Modified to form a spoon like structure known as lingual nail such as ducks, geese and swans

[15] This structure is flexible enough that it can be stretched and in Northern Pintail (*Anas acuta*) function for lifting grains [16]. The median groove of the tongue is important in directing food transport [4]. The bristles on the lingual lateral border function with the lamellae of the bill to filter particles [3, 9]. Lamellae of the bill of the Northern Pintail such as those of the Egyptian geese [12] are used during food collecting process and in filtering of particles.

Dietary specialization and the effective manipulation of food in Northern Pintail depends on rigid structures such as lamellae, papillae and bristles of the animal tongue. The median groove located on the dorsal surface of the lingual body of Northern pintail is an anatomical characteristics of the Mitterdorff's bean goose tongue [3] black kite [17] Egyptian goose tongue [12].

The lingual body and the lingual root of Northern pintail were separated by the conical papillary crest that directed backward. Conical papillae has a "V" shaped arrangement in the tongues of quail [18], Egyptian goose [12], Mitterdorff's bean goose [3] and in the long legged Buzzard [19]. On the other hand, papillary crest formed a letter "W" arrangement in the hoopoe [20]. In contrast to several species of birds the papillary crest is absent in Japanese pygmy wood pecker, ostrich, emu and Rhea Americana [13,21,22].

The orifices of the anterior glands were situated on the lateral surfaces of the posterior part of the lingual body, whereas the posterior lingual glands open on the entire surface of the lingual root [4].

The lingual salivary glands function in lubrication and moisture of food which help in rolling or sliding the food over smooth tongue surface towards the esophagus [23]. Also, salivary glands protect the tongue surface against coarse material and desiccation [24]. These anatomical characteristics attributed to feeding habits and life style of the birds and these structures are involved in collecting food by grazing. These conical papillae in the body and root of the tongue participate in cutting grass and shoots of plants.

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