

CONSIDERATIONS REGARDING THE DIGESTIVE SYSTEM IN THE RED-CRESTED POCHARD (*NETTA RUFINA*)

CONSIDERAȚII PRIVIND SISTEMUL DIGESTIV LA RAȚA CU CIUF (*NETTA RUFINA*)

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ABSTRACT | REZUMAT

As *Anatidae* are the most numerous groups of waterfowl, they have also attracted significant interest from researchers in identifying anatomical features to satisfy their scientific "curiosity" and be helpful in establishing criteria for taxonomic classification of existing or extinct species. Many species of *Anatidae* have been domesticated and are captive-bred for ornamental purposes, such as the species that is the subject of this study. In their case, the knowledge of anatomical and physiological particularities in these less investigated species is essential to ensure proper care and effective therapeutic interventions when needed. The study material was three individuals of *Netta rufina*, a species for which the data in the literature are low in numbers. However, we have obtained interesting results on the anatomy of the digestive system, exemplified by original photographs, that can complete the data in the literature, in the hope that they are helpful to those interested.

Keyword: red-crested pochard, digestive system, topography

Întrucât anatidele sunt grupul de păsări acvatice cel mai numeros, au atras și un interes pe măsură din partea cercetătorilor în privința identificării unor particularități anatomice, nu numai pentru a satisface „curiozitatea” științifică a acestora, dar și pentru a fi utile în stabilirea unor criterii de clasificare taxonomică a speciilor existente sau dispărute. Multe dintre speciile de anatide au fost domesticate și sunt crescute în captivitate cu scop ornamental, precum și specia ce a făcut subiectul prezentului studiu. În cazul acestora, cunoașterea particularităților anatomice și fiziologice la specii ca aceasta, mai puțin investigată, are importanță pentru a putea asigura atât o îngrijire corespunzătoare, cât și intervenții terapeutice eficiente atunci când acestea se impun. Materialul de studiu a fost reprezentat de trei exemplare de *Netta rufina*, o specie despre care datele din literatură sunt destul de reduse numeric. Putem aprecia însă că am obținut rezultate interesante, referitoare la anatomia aparatului digestiv, exemplificate prin fotografiile originale, care pot completa datele din literatură, în speranța că sunt utile celor interesați.

Cuvinte cheie: rața cu ciuf, sistem digestiv, topografie

Ducks are the most numerous groups of waterfowl, with over 30 species found in Europe, including 21 in Romania's fauna. The red-crested pochard (*Netta rufina*) is a large duck with distinct sexual dimorphism, that nests in the Danube Delta and the Razim-Sinoie Complex in Romania, as well as a few locations north-east of the Romanian Plain (Bărăgan) (14). According to the International Union for Conservation of Nature's (IUCN) list of conservation, the species is included in the category of low risk, more precisely "Least concern" (13). In the field of research, various studies have been conducted on the digestive system of wild *Anatidae* species, although the number of such studies is limited. Comparative research has mainly focused on the size of digestive organs in different anatid species, the impact of diet on the morphology of the digestive tract, and the morpho-functional changes following shifts in diet when feeding some wild species in

captivity (7, 1, 9). There are studies on species of the genus *Aythya* (7,8), which are very close phylogenetically to the species *Netta rufina*. However, no research has been identified that specifically focuses on the macroscopic or microscopic morphology of the digestive system in red-crested pochards. Regarding the species *Netta rufina*, in the literature, a series of details regarding the morphology of the skeleton (12), especially the skull (3, 10) and the respiratory system (4, 5, 6) were observed. Within the Romanian school of anatomy in Bucharest, the bird's digestive system was a subject addressed both from a macroscopic and microscopic point of view (2, 11).

MATERIALS AND METHODS

The studies were conducted on three fresh carcasses of *Netta rufina*, one female and two males. They were brought to the Faculty of Veterinary Medicine for necropsy from private breeders. The observed lesions did not affect the integrity of the digestive system (cranial trauma, brachial artery haemorrhage).

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The dissection was carried out using the classical method, and for the measurements, the usual instruments were used (calliper, compass, precision scale). The mentioned values represent the average of those recorded in the studied specimens. The most representative aspects were photographed and processed in Adobe Photoshop CS3. The identification, description, and homologation of the formations were carried out according to Nomina Anatomica Avium - 1993.

RESULTS AND DISCUSSIONS

The two parts of the beak (*Rostrum maxillare* and *Rostrum mandibulare*) covered by the integumental *Rhamphotheca* have the characteristics specific to palmipedes, the upper one being 55 mm long and 22 mm wide. The distance from its base to the caudal edge of the nostril is 15 mm (Figs 1, 2, and 3).



Fig. 1. Measurement of the total length of the upper part of the beak



Fig. 2. Measuring the distance between the nostril and the base of the beak



Fig. 3. Anatomical elements on the ventral face of the upper part of the beak. 1-*unguis maxillaris*; 2-lateral palatine ridges; 3-median palatine ridge; 4-palatine papillae; 5-palatine groove; 6-intermediate palatine ridges; 7-rostral extremity of the choana.

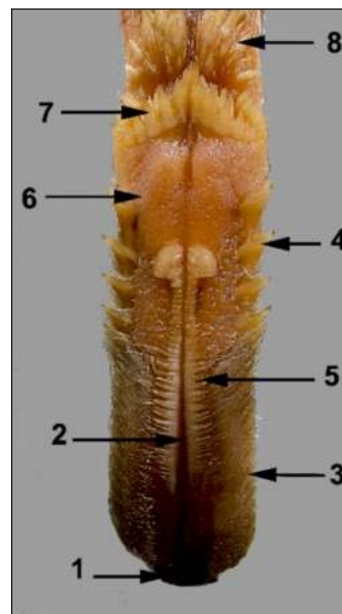


Fig. 4. Dorsal view of tongue in *Netta rufina*. 1-apex of the tongue; 2-median lingual groove; 3-small conical papillae; 4-large conical papillae; 5-lingual pecten; 6-lingual torus; 7-caudal lingual papillae; 8-pharyngeal papillae.

The tongue has a total length of 41 mm. The width of the organ is 12 mm, constant throughout its length. The lingual groove runs the entire length of the dorsal surface. On each side of the body, there are five large conical papillae. The lingual pecten is approximately 20 mm long. The filiform papillae that adorn it have an

average length of 1.5 mm. Each pecten terminates in a keratinized formation located on the rostral side of the lingual torus, which is approximately 2.3 mm long and 2.1 mm wide, which does not present papillae.

The lingual torus is 18 mm long and 4.5 mm wide. It is bounded caudally by a row of 11 conical papillae, the central ones longer than 3.5 mm. Two areas of pharyngeal papillae are located behind the torus, separated by a median groove and separated from it by two narrow oblique grooves. These areas are covered with keratinized conical papillae, those on the aboral side being comparable in appearance to the aboral lingual ones (Figs 4 and 5).

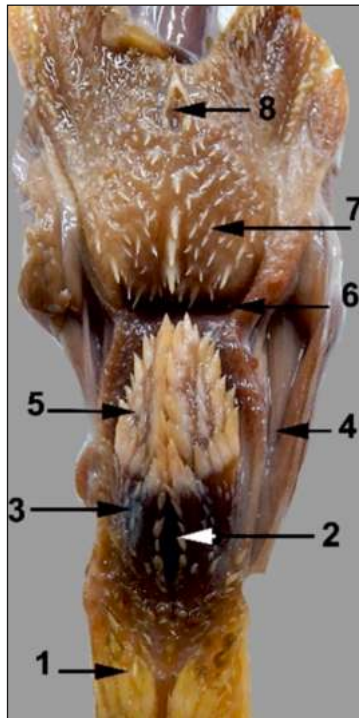


Fig. 5. Aboral area of the oropharyngeal cavity after the wide opening of the two valves (dorso-rostral view). 1-pharyngeal papillae; 2-glottis; 3-laryngeal prominence; 4-the lateral part of the pharyngeal cavity; 5-caudal pharyngeal papillae; 6- the opening of the esophagus; 7-palatine papillae; 8-opening of the pharyngo-tympanic tubes.

The glottis is 8 mm long, the laryngeal prominence being ornamented with reduced and rare conical papillae. The maximum width of this protrusion is 9.5 mm. The pharyngeal papillae are very well represented, especially those near the median groove, exceeding 2 mm in length.

The oesophagus is 16-16.5 cm long in the cervical area. The outer diameter is relatively uniform in the middle third and anterior to the cranial thoracic aperture, measuring about 6 mm. There is no crop. The topography of the oesophagus presents a series of peculiarities due to the special morphology of the trachea. The trachea has a variable calibre in the cervical region. In the anterior third of the neck, it presents a di-

lated region (with a fusiform appearance) whose large (transversal) diameter is 11 mm and the small diameter is 8 mm. In the area of the first flexure, the trachea is placed in the concavity of this flexure. In the middle third of the neck, the large diameter of the trachea is 9 mm, then as it advances distally, the diameter progressively increases (Fig. 6).

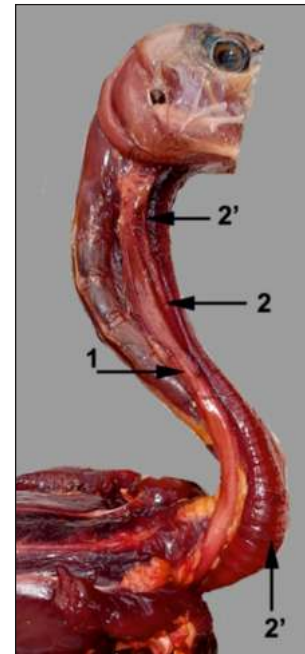


Fig. 6. Lateral view of the cervical region in *Netta rufina*. 1-esophagus; 2-trachea; 2'-tracheal dilatations.

It deviates slightly on the left side of the second flexure, where it reaches its maximum size, in cross-section having a slightly elliptical contour, with a large diameter of about 14 mm and a small one of about 9 mm. At the entrance to the thoracic cavity, where it intersects the clavicle, the calibre of the trachea is reduced again, the dimensions at this level being, on average, 10 mm. It is also repositioned on the ventral side of the vertebral column.

As a result, in the area of the first cervical curvature, the oesophagus is placed on the right side of the trachea, not having direct relations with the muscles, so that then, in the area of the second cervical flexure, it moves to the caudal side of the dilated portion of the trachea, having at this level contact with the cervical muscles on the right side. At the level of the cranial thoracic aperture, it will be positioned on the dorsal side of the trachea, occupying a membranous groove of it. Between the trachea and the oesophagus, there is a fascial fold, wide in the dilated areas of the trachea and narrower in the middle third.

The glandular stomach (proventriculus) originates behind the base of the heart and then passes on the dorsal surface of the left hepatic lobe, which surrounds it almost completely except for the dorsal surface. It is related to the ventral face of the left kidney.

The diameter increases progressively in the craniocaudal sense, approximately 5 mm at the origin and 10 mm at the opening in the muscular stomach.

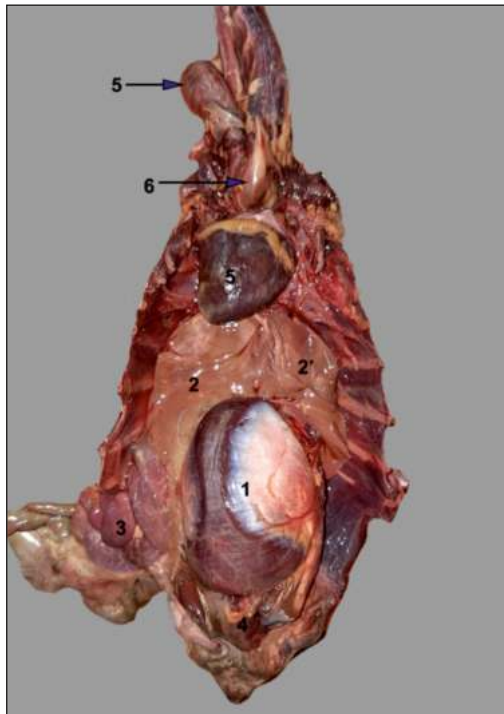


Fig. 7. Topography of the viscera in the thoracoabdominal cavity, after its opening, in *Netta rufina*. 1- muscular stomach; 2-right hepatic lobe; 2'-left liver lobe; 3-jejunal loops shifted to the right; 4-cloaca; 5-distal dilatation of the trachea; 6-syrinx.

The muscular stomach (ventricle) is excessively developed (Fig. 7). The longitudinal diameter is approximately 78 mm, and the transverse diameter is 45 mm. Considering that the approximate length of the trunk was 170 mm, the muscle stomach occupies almost half its length (45.8%). The mass of this compartment, emptied of its contents, was, on average, 90 g. Considering that the average mass of the bird was 914 g, expressed as a percentage, the mass of the ventricle represents almost a tenth - 9.84%.

The duodenum forms a loop measuring approximately 15 cm in length. The **jejunal loops** are spirally arranged in the form of 4 segments and are about the right wall of the abdominal cavity. At the ventral edge of the last jejunal loop originates the relatively long **ileum**, 120 mm and with a calibre of 13 mm, flanked dorsally and ventrally by the two long and thin **caeca**, the anterior third of which is free and connected to the ileum by ileo-cecal ligaments. The caeca are 20 cm long. They progressively narrow towards the posterior extremity (the ileo-ceco-colic portion). **The colon** is approximately 100 mm long and has a constant calibre of 15 mm, slightly dilated towards the coprodeum. The two lobes of the **liver** completely cover the proventriculus. The left lobe is extended far caudally by a process adjacent to the right face of the ventricle.

CONCLUSIONS

Although it has characteristics common to other palmipede species, the tongue presents a characteristic morphology and topography that are different from other palmipedes and the subject of other specialized works. The topography of the oesophagus is primarily influenced by the anatomical features of the trachea in the cervical region. In the case of the thoraco-abdominal viscera, the muscular stomach (ventricle) stands out for its enormous volume with a length that reaches approximately 50% of that of the trunk and a mass that approaches 10% of that of the body. We appreciate that additional microscopic information is needed to better understand the functions of each digestive segment involved in the physiology of digestion.

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