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MORPHOLOGICAL ASPECTS OF THE APPENDICULAR SKELETON IN THE COMMON SHELDUCK (*TADORNA TADORNA*)

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Abstract: From a taxonomic point of view, *Anseriformes* are a highly differentiated avian order which includes over 150 species. At the same time, it is one of the most studied flying groups due to its historical importance in domestication and the poultry industry. We conducted a thorough morphological analysis of the skeleton of the *Tadorna tadorna* species. In addition, we compared specific results with those of some authors who analyzed the mallard (*Anas platyrhynchos*) from a morphological point of view. Some significant differences have been described for the first time, such as the appearance of the articular humeral head, the deltoid crest and the brachial fossa. At a femoral level, we identified a developed impression, the iliotrochanteric muscles insertion surface, and we described the topography of the ischiofemoral and caudofemoral muscles insertion rugosity.

• Introduction

The shelducks belong to a genus of wading birds (*Tadorna*) in the order *Anseriformes*, family *Anatidae*. Two species are found in Romania: the common shelduck (*Tadorna tadorna*) and the ruddy shelduck (*Tadorna ferruginea*).

• Material and method

- Bones from four specimens: two female common shelducks (*Tadorna tadorna*) and two female mallards (*Anas platyrhynchos*) represented the study material. The shelduck's bones belong to Grigore Antipa Museum of Natural Sciences, with inventory numbers 15485 and 15486. The mallard bones were prepared using the maceration method from two specimens harvested in the 2023-2024 season in the Glodeanu region, county Buzau. The measurements were made with the calliper, and the images were taken with a Nikon Coolpix L820 camera. The values described are the averages for each category of birds. The terminology used follows Nomina Anatomica Avium -1993.

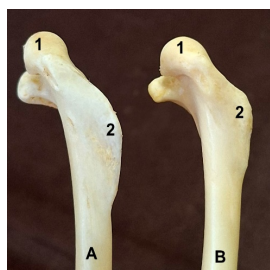


Fig. 1. Proximal extremity of right humerus in common shelduck (A) and mallard (B) in dorsal view (original)
1-humeral head; 2-deltopectoral crest

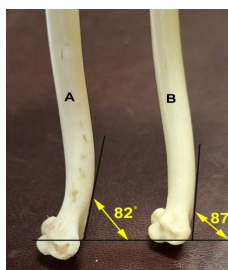


Fig. 2. Distal extremity of right humerus in common shelduck (A) and mallard (B) in ventral view (original)

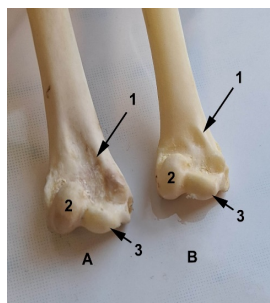


Fig. 3. Distal extremity of right humerus in common shelduck (A) and mallard (B) in cranial view (original)
1-fossa of the brachial muscle; 2-dorsal condyle; 3-ventral condyle.

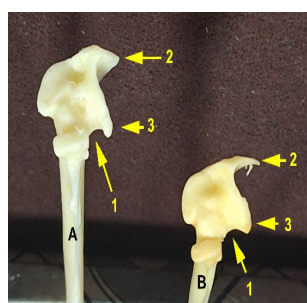


Fig. 6. Proximal extremity of the right tibiotarsus in the common shelduck (A) and mallard (B), dorso-lateral view (original)
1- tibial notch; 2-cranial cnemial crest; 3- lateral cnemial crest

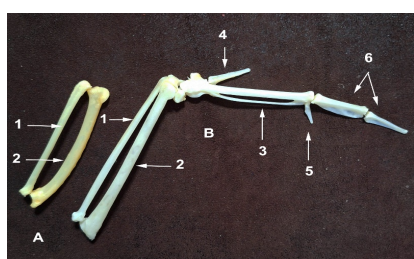


Fig. 4. Forearm bones in mallard (A) and bones of forearm and thoracic autopodium in common shelduck (B), right limb dorsal view (original)
1-radius; 2-ulna; 3-metacarpal bones; 4-phalanx of the minor digit; 5-phalanx of the alular digit; 6-phalanges of the major digit.

• Results and discussions

The humerus represents the longest skeleton bone, with a solid articular head, a wide pneumatic foramen and a cylindrical diaphysis. In dorsal view, the deltopectoral crest (*Crista deltopectoralis*) was more prominent in mallard, forming an angle of about 130°, while in common shelduck, it was curved, with the appearance of a semicircular arch (Fig.1). In the dorsal view, it was observed that the distal epiphysis of the common shelduck was displaced dorsally and much more accentuated than that of the mallard (Fig.2). The brachial muscle fossa (*Fossa m. brachialis*), in common shelduck, is wide and extends proximally on the diaphysis, measuring approximately 13-14 mm, starting from the level of the proximal edge of the ventral condyle. In mallard, it is represented by two short fosses, exceeding only 7.5-8 mm at the edge of the ventral condyle (Fig. 3).

In the common shelduck, **the alular digit** consists of a **single phalanx** (*Phalanx digiti alulae*) and the major digit has **two phalanges** (*Phalanx proximalis digiti majoris*, *Phalanx distalis digiti majoris*), with the distal one being morphometrically similar to that of the alular digit (Fig. 4).

The tibiotarsus was perfectly straight in both species. The average length was 103.8 mm in the common shelduck and 89 mm in the mallard. The cranial cnemial crest (*Crista cnemialis cranialis*) is more developed in mallard, and the tibial notch (*Incisure tibialis*) is deeper (Fig. 6).

• Conclusions

- The common shelduck's appendicular skeleton is similar to the mallard's in terms of the number of bones and morphological characteristics. However, indisputable anatomical differences exist between the bones of the two species.
- The most significant differences are found at the level of long bones. In the forelimb, absolute differences are found within the deltopectoral crest, the absolute fossa of the humerus and the angle between the distal diaphysis and the humeral epiphysis in the two species. In the pelvic limb, in the case of the femur, the topography of the ilio-trochanteric crest, the position of the two condyles correlated with the vertical axis, and in the case of the tibia, the value of the angle between the distal extremity and the axis of the bone are significantly different in between the two species.
- In conclusion, the differential elements identified are described for the first time, supporting the establishment of this species' morphological profile and, if necessary, differentiating the bones from those of the mallard.



Fig. 5. The femur of mallard (A), common shelduck (B) and tarsometatarsus of mallard (C) and common shelduck (D), right limb, cranial view (original)
It is observed that in mallard the tarsometatarsus is shorter than the femur, in common shelduck the situation is reversed.