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MORPHOLOGICAL FEATURES OF THE SKULL IN THE DWARF KANGAROO (*Macropus rufogriseus*)

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Abstract

The study aims to analyze and describe the morphological characteristics of the skull in the dwarf kangaroo (Macropus rufogriseus). The morphological peculiarities of the skull can be useful elements for the recognition of the species. Data from the literature on the morphology of the skull in this species is limited and mostly focuses on the peculiarities of the muscles in the head. An adult dwarf kangaroo, who died of natural causes was used for this study. The study of the morphological features of the skull leadto the following conclusions: the skull is compact and elongated, the viscerocranium is more developed than the neurocranium, the external sagittal crest is absent, the zygomatic process of the frontal is replaced by a rounded crest separating the frontal surface from the orbital one, two lacrimal foramina are present, the horizontal portion of the palatine is narrow and provided with 8-10 caudo-lateral palatine foramina, there is no alar hole nor channel, the zygomatic bone has a salient spine in the rostral direction.

Key words*: dwarf kangaroo, skull, palatine, alar foramen.*

INTRODUCTION

The dwarf kangaroo *(Macropus rufogriseus)* (Desmarest, 1817) is included in the Order Marsupialia, an order that includes marsupial mammals, belonging to the Macropodidae Family, Genus Macropus.

It is a species that lives in southern and eastern Australia, in Tasmania, where their number is constantly growing, due to restrictive measures regarding the hunting of these species.

On the territory of Europe are found in zoos, and in rare cases, even pets (Bensley, 1903; Jackson, 2011)

The literature contains a small number of data on the morphological features of the skull in the dwarf kangaroo (Windle, & Parsons, 1897; Linzey, 2020; Georgescu et al., 2017; Kardong, 2009).

The study, that was performed on the skull of a dwarf kangaroo *(Macropus rufogriseus)*, aimed at presenting some features in order to be differentiated from other species within the same family, as well as with species belonging to the Order Marsupialia.

Due to the very low number of dwarf kangaroos in captivity, the morphology of the skull in this species has been very little studied in Romania.

MATERIALS AND METHODS

The study material was a specimen of dwarf kangaroo *(Macropus rufogriseus)*, donated by a private individual.

The skull was thoroughly cleaned of soft tissue, then subjected to the process of controlled maceration, washing and degreasing.

The maceration was performed in vessels maintained at a constant temperature (approximately 50 days), under permanent supervision, involving a long process of putrefaction (directed, controlled, etc.).

The washing was carried out in a first step in a continuous stream of water for 24-48 hours. Rinse after maceration with the tip of a scalpel to remove all organic debris.

Degreasing was performed using common detergents diluted in wash water. Wash with slightly acidified water and check for any traces of organic matter.

The drying of the obtained bones was performed under supervision for 48-56 hours at an average temperature of 18-22°C to avoid cracking of the bone structures, in order to not compromise their integrity.

Bleaching was performed by immersing the skull in 30% perhydrol (H_2O_2) solution and then drying it.
The most interesting aspects were described and photographed. The description, identify-cation and homologation were performed according to the Nomina Anatomica Veterinaria, 6th ed. (2017).

RESULTS AND DISCUSSIONS

In the dwarf kangaroo *(Macropus rufogriseus)*, the skull has a slightly elongated appearance, with a small width at the level of the viscerocranium.
The dorsal face of the skull has the largest width at the level of detachment of the zygomatic processes of the temporal bones.
The external occipital protuberance is small and has a convex appearance in the transverse direction.
The outer sagittal crest is absent. From the level of the external occipital protuberance, two temporal lines start in the rostral direction to the level of the fronto-parietal suture.
The zygomatic process of the frontal has the appearance of a reduced, rounded crest, which separates the frontal surface from the orbital one.

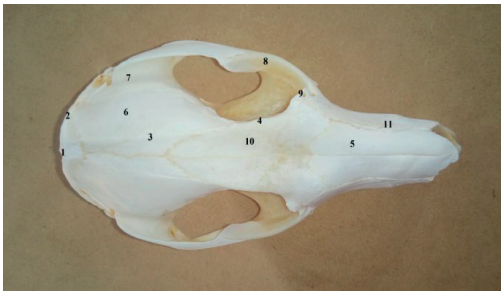

Figure 1. Dorsal face of the skull in the dwarf kangaroo (*Macropus rufogriseus*): 1. External occipital protuberance; 2. Nuchal crest; 3. Temporal line; 4. Zygomatic process of the frontal (rounded crest); 5. Nasal; 6. Parietal; 7. The zygomatic process of the temporalis; 8. Zygomatic; 9. Lacrimal foramen; 10. Frontal; 11. Nasal process of the incisor

The nasal bone in the rostral extremity ends bifidly, the medial portion being much longer than the lateral one.
There is a salient orbital process between the frontal and lacrimal bones.
The parietal bones are elongated, with a slightly convex exocranial face, being traversed by the temporal lines.
The nasal process of the incisor is widened and delimits with the oral extremity of the nasal a small nasal-incisive incision.
The lateral face of the skull has an incomplete orbit.
At the level of the zygomatic bone, a reduced spine is observed rostral, and an obvious muscular insertion spine is arranged ventrally.
The zygomatic process of the temporalis, flattened latero-medially, is wider in the caudal part, presenting ventrally a glenoid cavity elongated transversely, for articulation with the condyle of the mandible.
On the facial surface of the lacrimal bone are arranged two lacrimal foramina separated by a small tuber.
The maxillary foramen, located at the level of the pterygo-palatine fossa, communicates with the infraorbital foramen, wide, of oval aspect, through a very short infraorbital canal. A caudo-medial maxillary foramen has a salient spheno-palatine foramen.

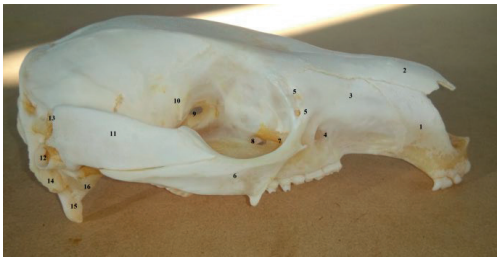

Figure 2. The lateral face of the skull in the dwarf kangaroo (*Macropus rufogriseus*): 1. Incisive; 2. Nasal; 3. Maxilla; 4. Infraorbital foramen; 5. Lacrimal foramina; 6. Zygomatic; 7. Maxillary foramen; 8. Spheno-palatine foramina; 9. Ethmoidal foramen; 10. Orbito-temporal crest; 11. The zygomatic process of the temporal;12. External auditory canal; 13. Retroglenoid foramen;14. The mastoid process; 15. Jugular process;16. Tympanic bulla

The orbital hiatus has a wide foramen, representing the common opening of the optic nerve foramen and the orbital fissure. The ethmoidal foramen is situated cranial to the optic nerve foramen. The large round foramen is separated from the optic nerve foramen by a thin bone blade. The wing foramen and the wing channel are absent.

The diastema has a concave appearance and lacks a canine socket.
The external auditory canal, of circular shape, reduced, covers in its caudal part the opening of the stylo-mastoid foramen.
The mastoid process of the petrous part is reduced.
On the ventral face of the skull is observed the very long basisphenoid, wider in the caudal extremity and narrow in its rostral extremity. The wings of the presphenoid are well highlighted, while the wings of the basisphenoid are very short.
The condyles of the occipital have an oblique arrangement, and above them, in the caudal part of the condylar fossa, the hypoglossal nerve foramen is observed. The condylar fossae are narrow and deep.
Medially the base of the jugular process is the caudal foramen lacerum and the jugular foramen. The eardrum is very small.
Near the wings of the basisphenoid there are two foramina: the rostral carotid foramen, and the caudo-lateral to this oval foramen.
The rostral carotid foramen is placed in a deep depresion at the boundary between the body and the wings of the basisphenoid.

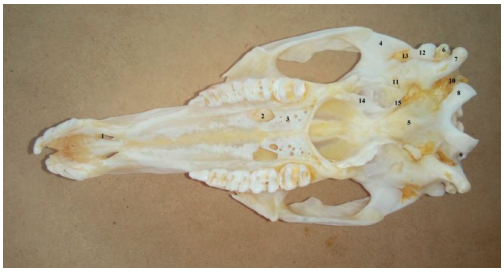

Figure 3. The ventral face of the skull in the dwarf kangaroo (*Macropus rufogriseus*): 1. Palatine fissure; 2. Palatine space; 3. Caudo-lateral palatine foramina; 4. Articular surface for the mandible condyle; 5. Basisphenoid; 6. The mastoid process; 7. Jugular process; 8. Occipital condyle; 9. Hypoglossal nerve foramen; 10. Foramen lacerum; 11. Oval foramen; 12. External auditory canal; 13. Musculotubal canal; 14. Presphenoid wings; 15. The wings of the basisphenoid

A retroglenoidal foramen is arranged caudal of the oval foramen, and the musculotubar canal is arranged medially from it.
The temporal articular surface is small, represented by an elongated transverse glenoid cavity.
The palatine arch is long, and at the junction between the horizontal portion of the palatine and the palatal portion of the maxilla, a wide maxillo-palatal space is observed that is arranged caudally to the limit between the 1st and 2nd upper molar.
The horizontal portion of the palatine bone is thin and presents 8-10 caudolateral palatine foramina with variable diameters.
In the rostral extremity of the ventral face, palatine fissures are observed, elongated and narrow.
On the nuchal surface of the skull there is a wide occipital foramen, oval in appearance, delimited by two obliquely arranged condyles.
The jugular processes are well highlighted, from their base starts in the dorsal direction a well-highlighted muscular crest, which reaches the level of the nuchal crest. Under the nuchal ridges on the sides there is a small foramen.
From the union of the nuchal ridges in the dorsal plane, a small occipital protuberance is formed, convex in a transversal direction.
The external occipital crest is evident in the upper third of the exocranial face of the occipital.

Figure 4. The nuchal face of the skull in the dwarf kangaroo (*Macropus rufogriseus*): 1. External occipital protuberance; 2. External occipital crest; 3. Jugular process; 4. Occipital condyle; 5. Occipital foramen; 6. Nuchall crest; 7. Mastoid process

The mandible of the dwarf kangaroo (*Macropus rufogriseus*) is aneven bone. On each mandible there is only one alveolus for the incisor, and the diastema is long and there is no alveolus for the canine.
The horizontal portion of the mandible is slightly convex.
The angular process, developed, is pulled much medially making a wide fossa between the shat and the branch of the mandible.

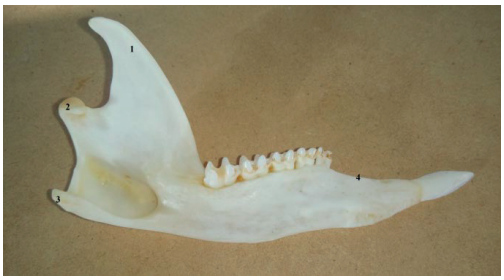

Figure 5. Mandible in the dwarf kangaroo (*Macropus rufogriseus*) - medial face: 1. Coronoid process; 2. Condilar process; 3. Angular process; 4. Diastema

The masseter fossa is deep and communicates with the pterygoid fossa through a wide foramen located in the ventral plane.
The condylar process is slightly oblique to the transverse plane, presenting the latero-medial convex-concave surface.

Figure 6. Jaw to the dwarf kangaroo (*Macropus rufogriseus*) - side face: 1. Mental hole; 2. Masseter fossa; 3. Communication port; 4. Condilar process; 5. Coronoid process

The coronoid process is abruptly curved and ends in taper.
The corono-condylar notch is wide and shallow.
On the lateral face there is a single mental foramen, and the diastema is very well highlighted.

CONCLUSIONS

On the dorsal face of the skull there is a reduced occipital protuberance, and the external sagittal crest is absent.
The zygomatic process of the frontal has the appearance of a reduced, rounded crest.
The external sagittal crest is absent, the temporal lines extend from the level of the external occipital protuberance.
On the facial surface of the lacrimal bone are situated two lacrimal foramina separated by a small tuber.
The infraorbital canal is very short.
At the level of the orbital hiatus, the ethmoidal foramen, the orbitoround foramen and common foramen, the optic nerve foramen and the orbital fissure open.
The wing hole and the wing channel are absent.
The basisphenoid is very long, with a wide caudal extremity and a narrow rostral extremity.
The tympanic bulla is not salient.
At the junction between the palatine portion of the maxilla and the horizontal portion of the palatine, a wide maxillo-palatine space is observed that is arranged caudally to the limit between the 1st and 2nd upper molar.
The horizontal portion of the palatine is thin and present 8-10 caudolateral palatin foramina.
From the base of the jugular process, an obvious muscular crest starts in the dorsal direction, reaching the nuchal crest.
The mandible has a much medial drawn angular process, with a very large masseteric fossa between the shaft and the curved branch of the mandible.
Between the two fossas, in the ventral plane, there is a communication orifice.

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