

MORPHOLOGICAL FEATURES OF THE AXIAL SKELETON TO BADGER (MELES MELES)

Constantin SPATARU

University of Applied Life Science and Environment from Iasi, Faculty of Veterinary Medicine

Address: M. Sadoveanu Street, No8, Iasi, Romania

cspatarufmv@yahoo.com

Abstract

Studies on the axial skeleton in badger reveal the specific morphological features such as: the atlas looks like the same in carnivores having the alar hole united with its vertebrae hole through a duct alar and the transverse hole is opened on the caudal edge of wings. The cranial articular surfaces are concave dorso-ventrally spaced between them allowing the flexion and extension. The odontoid process looks cylindrical having the cranial jointing surfaces slightly convex which continue the articular surface which are present on the ventral side of the odontoid process. The cervical vertebrae are large with the wide interarcuale spaces like in pigs, something that allows hyperextension of the neck and with the lamellar aspect of the transverse processes. The thoracic vertebra present the costotransversale processes detached from the vertebral body, with slightly concave surfaces costotransversale joint at the first half of vertebrae and flat to the last half. Mamilo-articular processes exceed the half of the spinous processes height and the jointing surface being slightly concave. The sacrum shows the median sacral crest with three spaced spine with cranio-caudal decrease, flanked by the symmetrical suprasacral spine which has two holes that open both dorsally and ventrally. Examining the aspects of the axial skeleton is remarkable the morphological similarity of these structures with those of pigs and canids.

Key words: badger, skeleton, axis, process, atlas

Introduction

Badger (*Meles meles*), also called Badger, is a plantigrade mammal which belongs to the Mustelidae family. This is one of the most famous families of the Carnivora Order together with Felidae, Ursidae and Canidae (Hrițcu Valentina, 2000).

Mustelids are small or medium sized mammals, with slim body, tail and legs are relatively short. The head is small, with generally short snout and ears. They are mainly carnivorous, occasionally consuming and cereals, fruits, bulbs. It is a small animal with a body length of 60 to 80cm, with a tail of 15-20 cm. Even if a small animal, he is strongly built. It has a small head, short neck and thick, pear-shaped body and a short tail. The legs are short and strong claws and presents massive, elongated, non-retractable, being adapted for digging, for this purposes it is used the snout that is flexible and sinewy (Rizac V, Coțofan V., Spătaru M.- 2000).

Material și methods

The material for the study originates from four bodies of Badger which were prepared by boiling or by scraping the surrounding tissue. It has been followed the shape, length and the development of the bone processes and joint surfaces, being permanently compared to the reference species, specificities discovered were illustrated by photos. The methods used were the dissection, observation, made measurements, description, then was resorted to make photo to the anatomical pieces. The results were interpreted according to the principles of anatomy and permanent correlated with information from the specific literature.

Results and discussion

Atlas has the shape of butterfly wings are latero-caudal detached. The cranio-lateral edges of the wings appear rounded, forming a semicircle and the caudal edges appear thicker being separated from the caudal jointing surfaces by two pits, each of them being drilled by a transversely hole. In the first third of the atlas, on the back of the atlas wings, close to the vertebral axis, are present the alaric hole and vertebrae hole which are connected by the alar groove. The dorsal arch is wider than the ventral arch, having cranially a rough spina and two smaller tuberosities, caudally. The ventral arch presents ventrally a smooth surface.

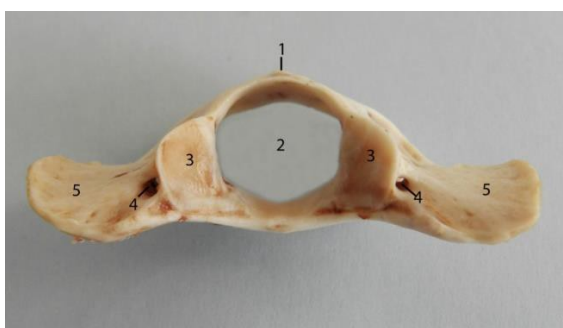


Figure no 1. Atlas in Badger– caudal aspect

1. Tuberculum dorsale, 2. Foramen vertebrale, 3. Fovea articularis caudalis,
4. Foramen transversarium, 5. Ala atlantis

The caudal articular surfaces are slightly concave and oval. They are bounded by a sharp ridge, exceeding vertebral area and continues with the articular surface of the dorsal face of the ventral arch.

The cranial jointing surfaces present, dorso-ventrally, a concave aspect, between them being wide and rough surfaces.



Figure no 2. Atlas in badger – caudo-dorsal aspect

1. Ala atlantis, 2. Foramen vertebrale laterale, 3. Foramen alare, 4. Sulcus alaris,
5. Fovea articularis caudalis, 6. Foramen transversarium, 7. Tuberculum dorsale

Axis is like an anvil, the spinous process being flattened. Caudally, it exceeds the caudal edge of the vertebral body. Caudal edge of the spinous process appears rounded ventrally is continued with one blade bone, connecting each articular processes.

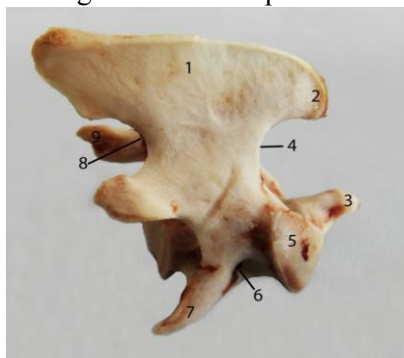


Figure no 3. Axis la badger – lateral aspect

- 1-2 Processus spinosus, 3. Procesul odontoid (Dens), 4. Incisura vertebralis cranialis, 5. Processus articularis cranialis, 6. Foramen transversarium, 7. Processus transversus, 8. Incisura vertebralis caudalis,
9. Processus articularis cranialis

The two blades delimitate caudally a very deep pit rough. The odontoid process looks cylindrical, with the cranial extremity oblique dorso-ventrally and cranio-cranially. The cranial jointing surfaces of the axis are slightly convex. They are continued with the articular surface of the ventral side of the odontoid process.

Transverse processes, lateral-caudal oriented, have an aciform aspect, easily exceed the articular surface of the body

The third to seventh cervical vertebrae are large, well deployed the transverse processes of the vertebral body, obliquely ventro-laterally oriented.

The cusps of transverse processes are well developed and detached. The transverse processes are crossed at the base by one large transverse hole.

All the transverse processes of the cervical vertebra tend bicuspid. At the last cervical vertebrae, the transverse process is triangular and unicuspid (Spataru C., Mihaela Claudia Spataru – 2007)

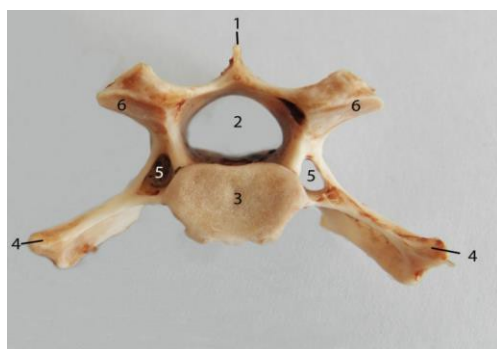


Figure no 4. The cervical vertebrae in badger –caudal view

1. Processus spinosus, 2. Foramen vertebrale, 3. Fosa vertebrales, 4. Processus transversus, 5. Foramen transversarium, 6. Processus articularis caudalis

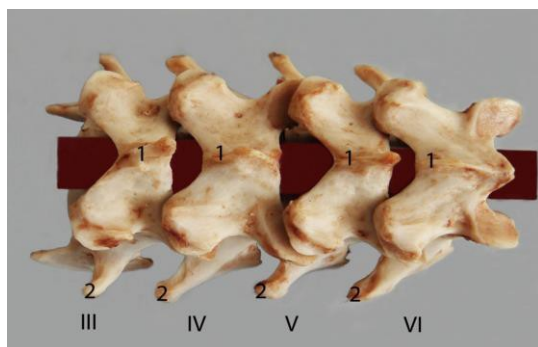


Figure no 5. The third to sixth cervical vertebra in badger – dorsal view

1. Processus spinosus, 2. Processus transversus

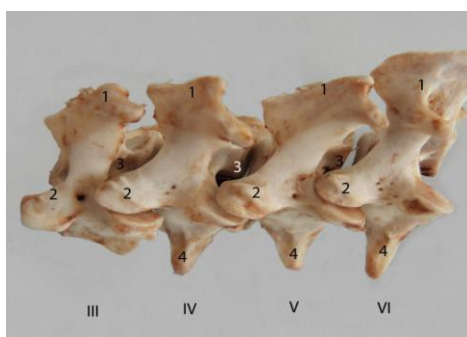


Figure no 6. The third to sixth cervical vertebra cervicale in badger– lateral view

1. Processus spinosus, 2. Processus articularis cranialis, 3. Foramen intervertebrale, 4. Processus transversus

Spinous processes have triangular aspect, sharp ended and slight cranio-caudal rise. The cranial edge is sharp and slightly convex and its caudal edge is slightly concave and thickened. The jointing surfaces are flat, the caudal processes have medio-lateral orientation, the cranial processes being latero-medially.

The vertebral body is dorso-ventrally slightly flattened vertebrae with the cranial jointing surface slightly convex and its caudal concave. The articular surfaces are oval, the transverse diameter being twice greater than the dorso-ventral diameter. The ventral side of the cervical vertebrae is smooth.

Thoracic vertebrae to badger are 14 in number. They are articulated with each other, forming the basis of anatomical spine. The spinous processes of the thoracic vertebrae in badger present upward growth from the first vertebra to the seventh vertebra, then decrease among XI-XIV vertebrae.

The latest thoracic vertebrae have similar the development and the height as the lumbar vertebrae. The cranial edge of spinous processes cranial is sharp and straight to the first four and last four vertebrae and to the fifth to tenth vertebrae, the cranial edge appears slightly concave. The caudal border of the spinous processes is thickened and straight to the first four and last four vertebrae and from fifth to tenth vertebrae is sharp and convex. The caudal articular processes, placed at the base of the spinous process, they point plan, dorsal-ventral orientation and the cranial articular processes, previously located on the back of the vertebral arch, are separated by a notch with slight medio-lateral orientation (Spataru C., Spataru M. – 2007).

Costotransversale processes, obviously, detached from the vertebra body, cranio-caudal decreasing, are provided with slightly concave costotransversal articular surface to the first half of vertebrae and flat in the second half of the thoracic vertebrae.

The mamillar processes are developed in cranio-caudally, reaching at the last thoracic vertebra to be approximately at the same level with the spinous process. The cranial vertebral notches are reduced and the caudal are deep, from the base of the vertebral arch bound along the lateral intervertebral holes.



Figure no 7. Thoracic vertebra in badger – cranial aspect

1. Processus spinosus, 2. Foramen vertebrale, 3. Extremitas cranialis, 4. Processus transversus, 5. Processus articularis cranialis, 6. Corpus vertebrae

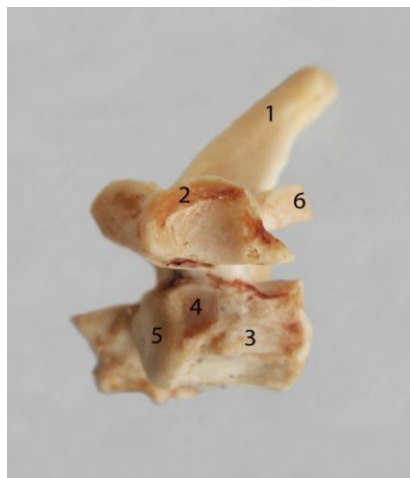


Figure no 8. Thoracic vertebra in badger – ventro-lateral view

1. Processus spinosus, 2. Processus mamillaris, 3. Corpus vertebrae, 4. Fovea costalis, 5. Caput vertebrae, 6. Processus articularis caudalis

The thoracic vertebrae have a short body, dorsal-ventral flattened and do not have the spinal ventral ridge. Cranial articular surfaces are flat and the caudal are easily concave. The cranial and caudal ribs foveas are slightly concave. In the last three thoracic vertebrae, the fovea ribs are only present cranially and are deeper and round.

At the badger, the lumbar vertebrae are 6.

Transverse processes grow from the first vertebra to IV. In the last two lumbar vertebrae, the transverse process decrease. They have lateral and cranio-caudally guidance being are perpendicular to the first four vertebrae and to the last two vertebrae, they hav caudo-cranial orientation.

The transverse processes are characterized by cranial and caudal sharp edges, with lateral rounded side edges.

Spinous processes have an average height and cranial and caudal edges are sharp. Dorsal edge of the spinous process of lumbar vertebrae is tuberos.

Mamilo-articular processes exceed half the height of the spinous processes. Their articular surface is slightly concave, dorso-ventral and dorsal and latero-medial orientated. To the first three lumbar vertebrae, the accessory is very developed, caudally continuing the mamilo-articular process and flank the lateral vertebral notches.

The lumbar vertebrae are longer than the thoracal and it is dorso-ventral flattened and do not have spinal ventral ridge.



Figure no 9. Lumbar vertebra in badger – dorso-lateral view

1. Processus spinosus, 2. Processus articularis cranialis, 3. Processus mamillaris, 4. Processus transversus, 5. Processus articularis caudalis

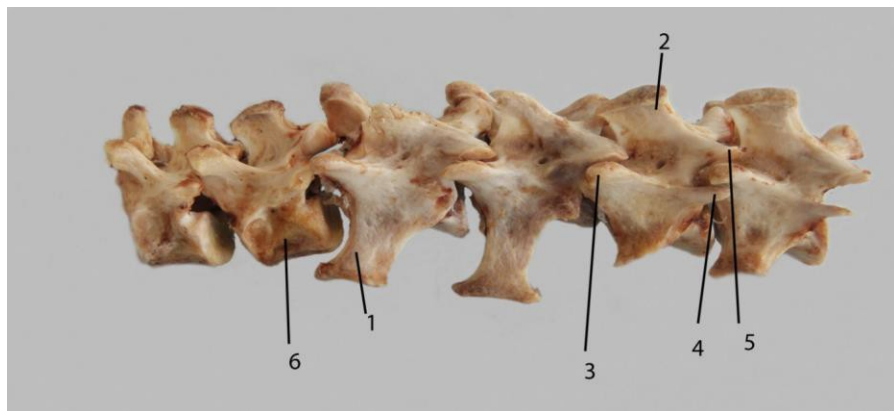


Figure no 10. Lumbar vertebrae in badger – dorso-lateral view

1. Processus transversus, 2. Processus spinosus, 3. Processus articularis cranialis, 4. Processus accesorius, 5. Processus articularis caudalis, 6. Corpus vertebrae



Figure no 11. The sacrum – dorsal view in badger

1. Ala ossis sacri, 2. Crista sacralis mediana, 3. Facies auricularis, L6. Vertebra VI lombară, Cc1. Prima vertebră coccigiană

Sacrum has a trapezoidal shape and its wings appear bolded.

Median sacral crest has three spaced spine, first being long about 1 cm and the other two decrease in height.

Ventrally, the sacrum has two subsacrale holes, symmetrical and wide that which open dorsally, being flanked by a spine.

Articular surface for the coxal is directed dorso-ventrally, being stretched over the whole lateral surface of it.

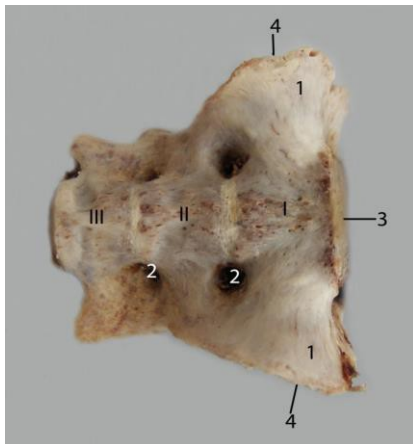


Figure no 12. The sacrum in badger – ventral view

1. Ala ossis sacri, 2. Foramina sacralia pelvina, 3. Processus articularis cranialis, 4. Facies auricularis



Figure no 13. The sacrum in badger – lateral view

1. Facies auricularis, 2. Crista sacralis mediana

Badger tail has a length 10-13 cm, composed of 17 vertebrae coccigene. The first five vertebrae show that decreases vertebral arch vertebra from first to fifth, then only the vertebral body.

Transverse processes are present in the first seven vertebrae and descending in order. They are present in half of the body vertebra delimiting the large intervertebral spaces, enabling movements of laterality.



Figure no 14. The tail vertebrae in badger – dorsal view

1. Processus mamillaris, 2. Processus transversus, 3. Processus spinosus, 4. Corpus vertebrae

Articular surface of the vertebral bodies have convex aspect.

Badger has a number of ribs 14, 7 sternal and 7 asternal. The head of the rib looks spherical with a long neck.

The articular surfaces for the foveal groove of ribs head are separated by a small ligament. The tuber of the rib descends from the first to the last rib, so missing the last ribs. The costotransvers articular surface is flat and lower than the corresponding articular surface transverse process of thoracic vertebrae.

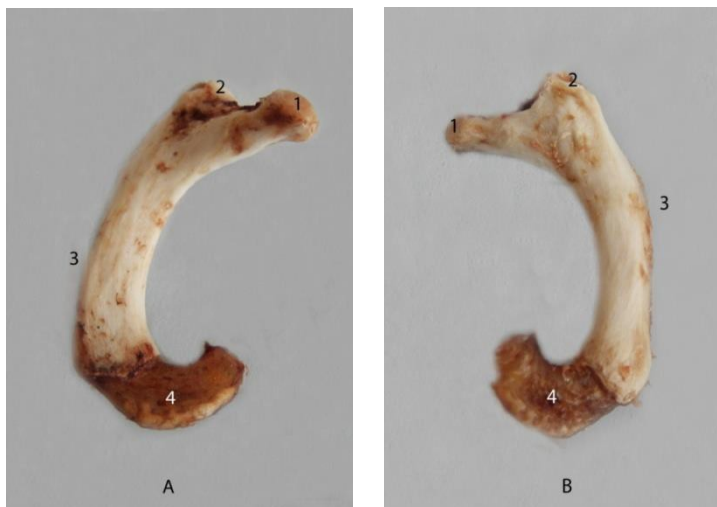


Figure no 15. First rib in badger – A – lateral aspect, B – medial aspect

1. facies articularis capitis costae, 2. Facies articularis tuberculi costae, 3. Angulus costae, 4. Cartilagine costales

Breastbone to badger consists of 7 vertebra, they look cylindrical and slightly lateral flattened. These are welded together with a fibro-cartilage discs.

Among vertebra are present the low foveas, which is the place of jointing with the chondro-sternal cartilage.



Figure no 16. The breastbone in badger, caudal view

1. Cartilago manubrii, 2. Sternebra,
3. Syncondroses sternales,
4. Cartilagine costales,
5. Syncondroses sternales

Conclusions:

1. Atlas, looking like carnivores, has the alaric hole united with the vertebral hole through an alar duct and transverse hole which is present caudally on the wing. Axis looks an anvil, odontoid process is cylindrical, transverse processes aspect are needle in form and vertebrae notches, semicircular.
2. The cervical vertebrae are large, have interarcual spaces noticeable and transverse processes have a lamellar aspect. Thoracic vertebrae presents the costotransversal processes detached from the vertebral body, with slightly concave costotransversal jointing surfaces at the first half of vertebrae, and at the second half, the articular surfaces are flat.
3. The ribs have the costotransversal surfaces flat, the articular surfaces of the rib head are separated by a small ligament groove.
4. The spinous processes of the lumbar vertebrae have sharp edges and its dorsal edge is tuberos. Mamilo-articular processes exceed half from the height of the spinous processes and the articular surface is slightly concave. The sacrum shows the median sacral crest of three spaced spine and cranio-caudal decreases.

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