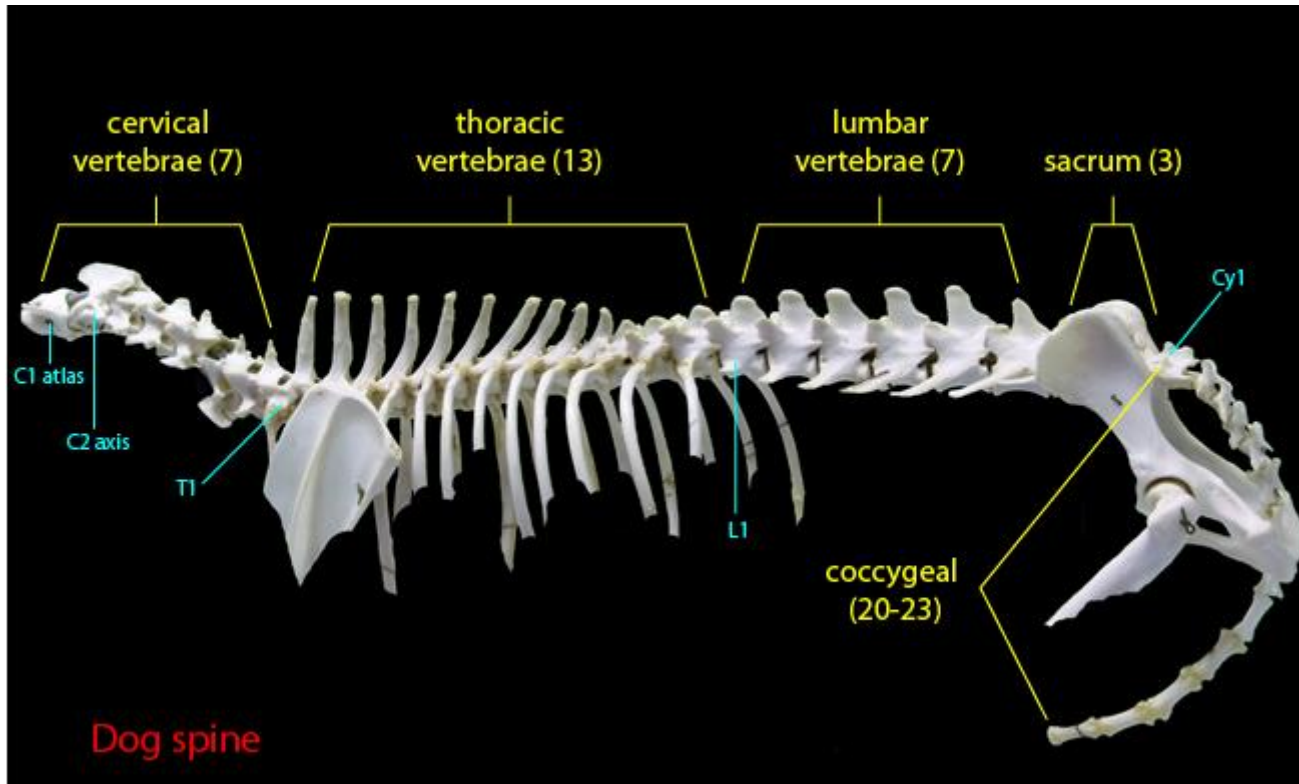


BONES OF THE TRUNK

**ANDREA HEINZLMANN
VETERINARY UNIVERSITY
DEPARTMENT OF ANATOMY AND HISTOLOGY
16TH SEPTEMBER 2019**

VERTEBRAL COLUMN (COLUMNA VERTEBRALIS)

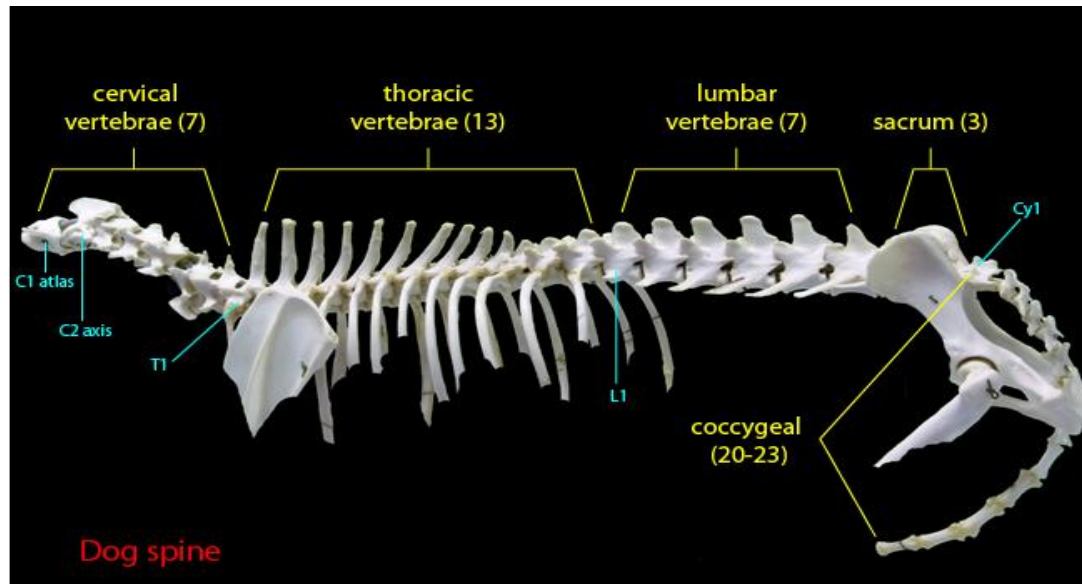
- the vertebral column composed of the vertebrae
- the vertebrae form a horizontal chain



VERTEBRAL COLUMN (COLUMNA VERTEBRALIS)

along the vertebral column three major curvatures are recognized:

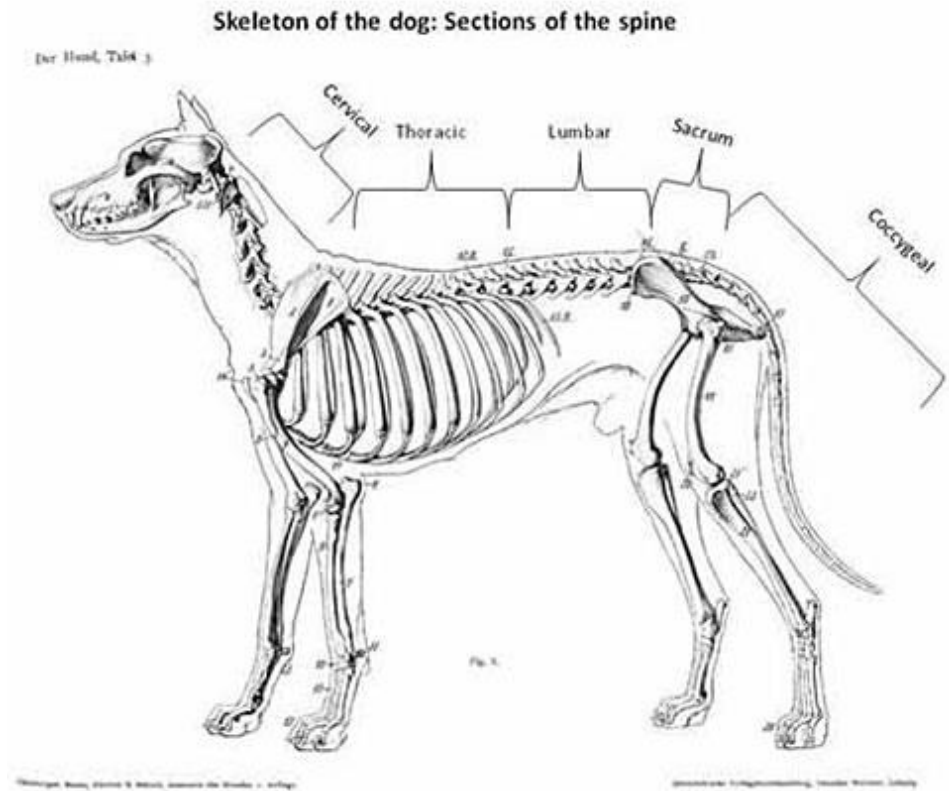
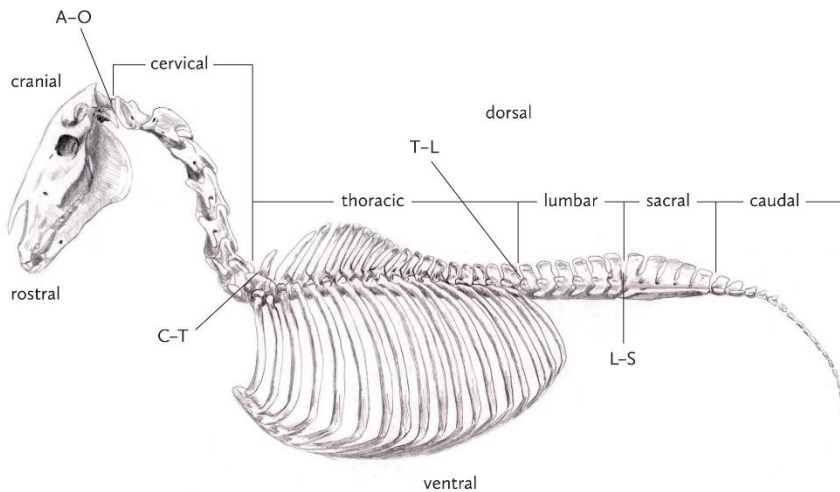
1. the DORSAL CONVEX CURVATURE – between the head and the neck
 2. the DORSAL CONCAVE CURVATURE – between the neck and the chest
 3. the DORSAL CONVEX CURVATURE – between the thorax and the lumbar region
- in carnivores (Ca) there is an additional DORSAL CONVEXITY in the sacral region



VERTEBRAL COLUMN (COLUMNA VERTEBRALIS)

- corresponding to the regions of the body, we distinguish:

1. CERVICAL VERTEBRAE
2. THORACIC VERTEBRAE
3. LUMBAR VERTEBRAE
4. SACRAL VERTEBRAE
5. CAUDAL (COCCYGEAL) VERTEBRAE



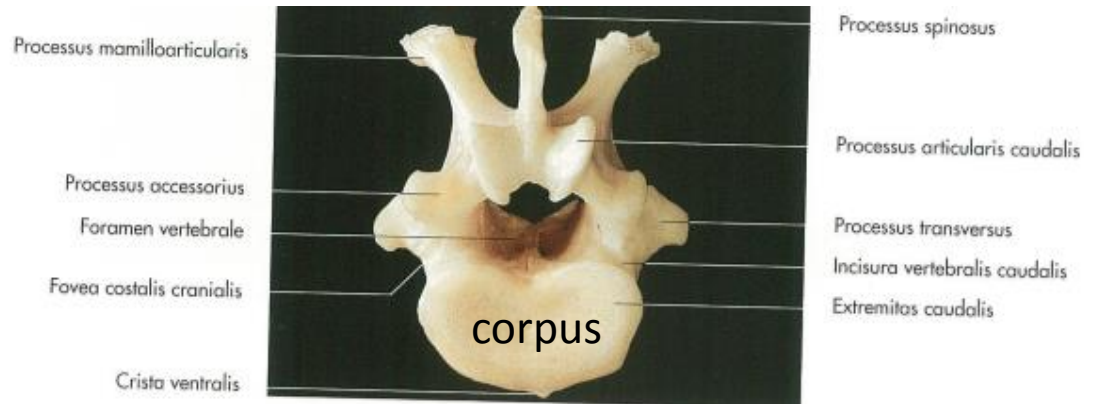
<https://www.ufaw.org.uk/dogs/french-bulldog-hemivertebrae>

<https://rogueshock.com/know-your-horse-in-9-ways/5/>

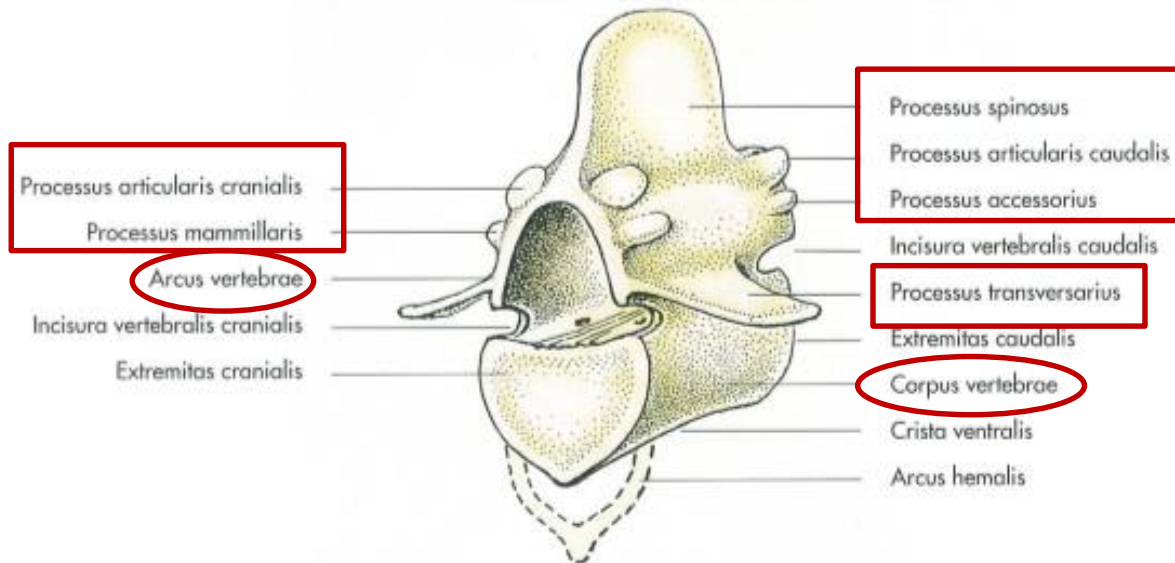
BUILD OF THE VERTEBRAE

each vertebrae presents:

1. BODY (CORPUS VERTEBRAE)
2. ARCH (ARCUS VERTEBRAE)
3. PROCESSES



Vertebra thoracica (Th13) , Ca.

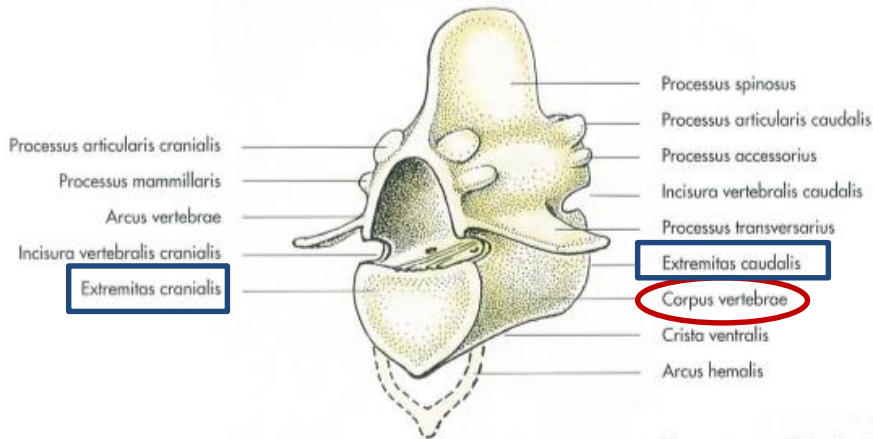


THE VERTEBRAL BODY (CORPUS VERTEBRAE)

- the ventral portion of the vertebra

ITS PARTS:

1. **EXTREMITAS CRANIALIS (seu CAPUT VERTEBRAE) – convex**
2. **EXTREMITAS CAUDALIS (seu FOSSA VERTEBRAE) - concave**



Th13, Ca.

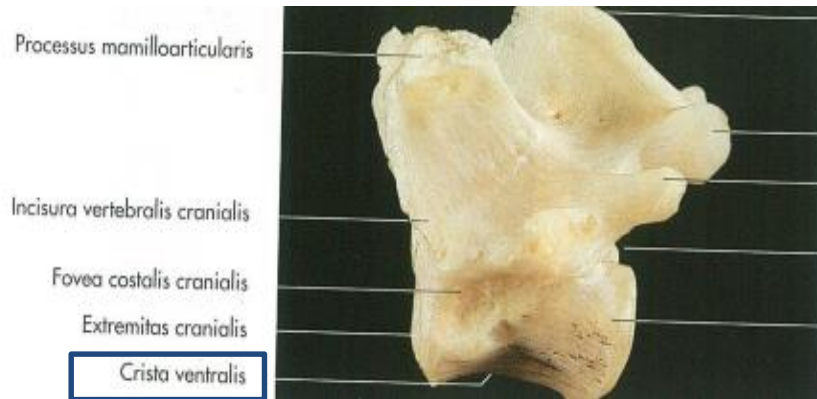
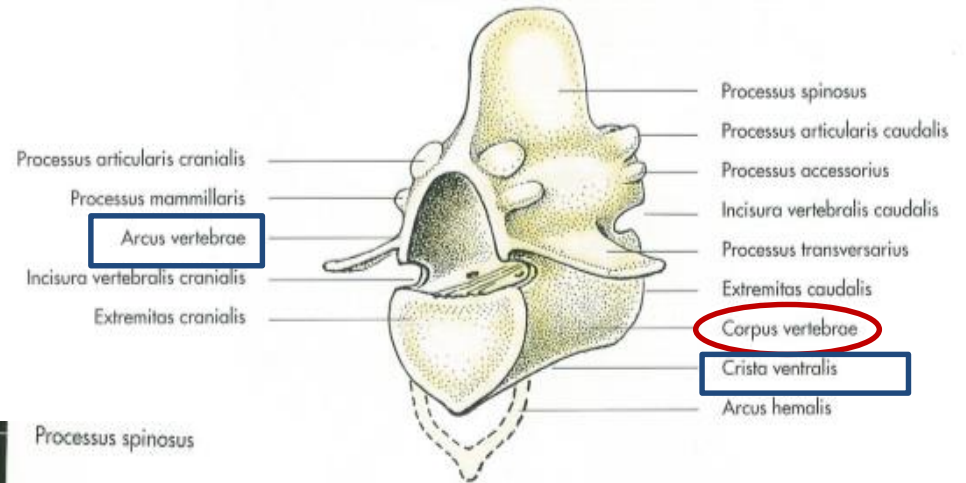
THE VERTEBRAL BODY (CORPUS VERTEBRAE)

3. VENTRAL SURFACE of the body has a:

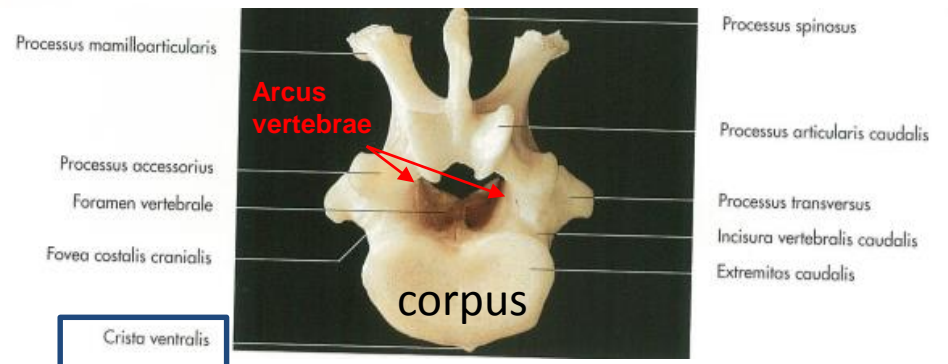
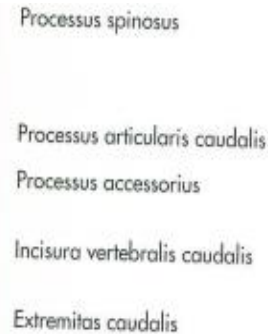
- ventral crest (CRISTA VENTRALIS)

4. DORSAL SURFACE of the body carries :

- the vertebral arch (ARCUS VERTEBRAE)



Th13, Ca., lateral aspect



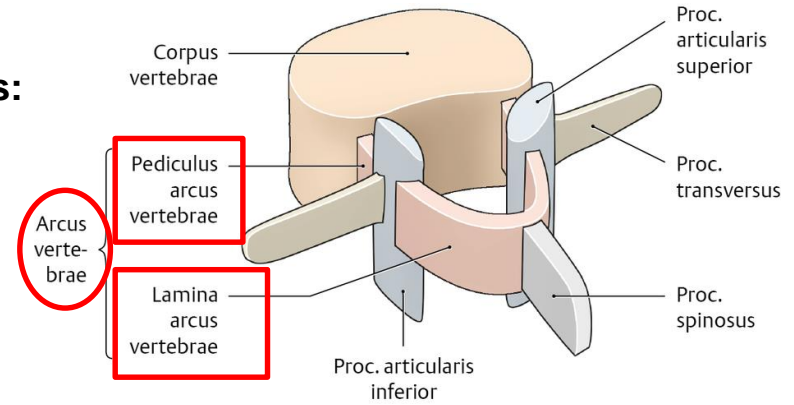
Vertebra thoracica (Th13) , Ca., caudal aspect

THE VERTEBRAL BODY (CORPUS VERTEBRAE)

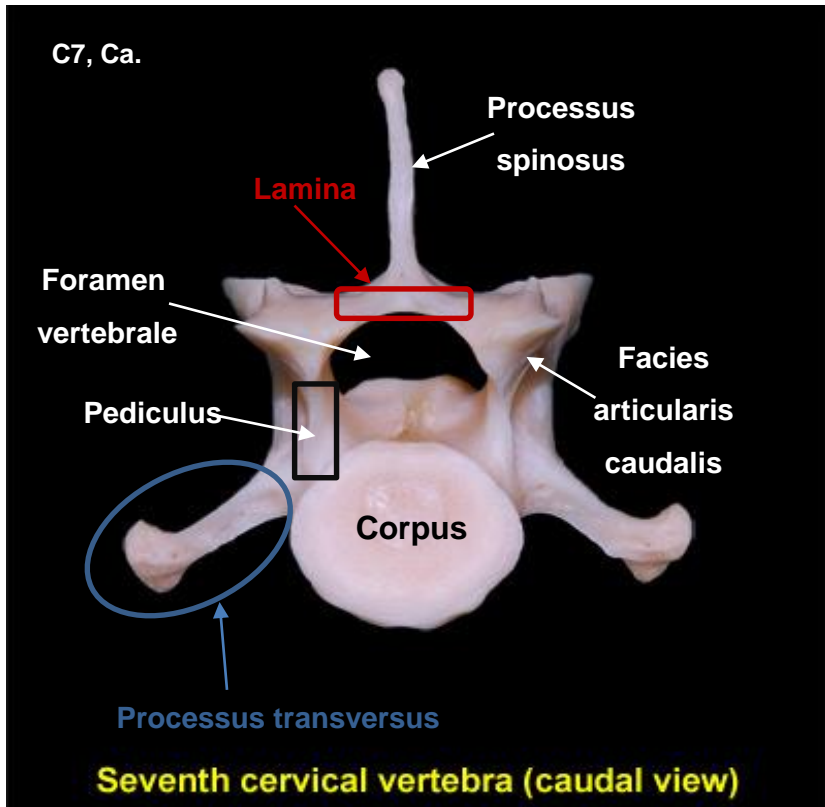
6. VERTEBRAL ARCH (ARCUS VERTEBRAE) comprises:

a) a ventral **PEDICULUS ARCUS VERTEBRAE**

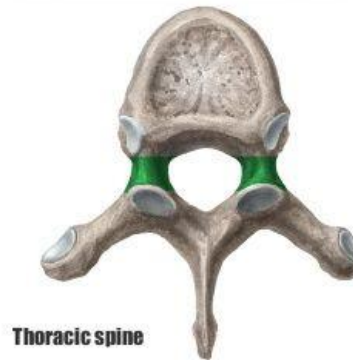
b) a dorsal **LAMINA ARCUS VERTEBRAE**



<https://viamedici.thieme.de/learnmodule/anatomie/wirbel+vertebrae?langtext=false>

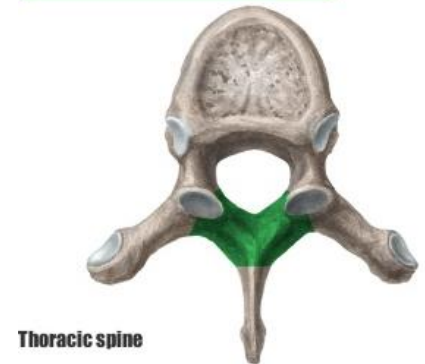


Pedicle of the vertebral arch
LATIN
Pediculus arcus vertebrae



<https://hu.pinterest.com/pin/736338607803330054/>

Lamina of the vertebral arch
LATIN
Lamina arcus vertebrae



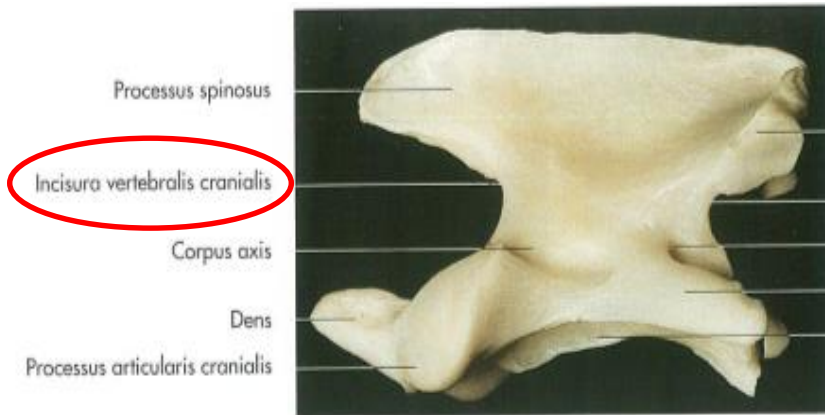
<https://www.slideshare.net/Kenhub/Anatomy/thoracic-lumbar-34616667>

THE VERTEBRAL BODY (CORPUS VERTEBRAE)

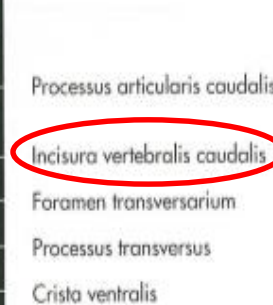
6. VERTEBRAL ARCH (ARCUS VERTEBRAE) notched:

c. cranially – INCISURA VERTEBRALIS CRANIALIS

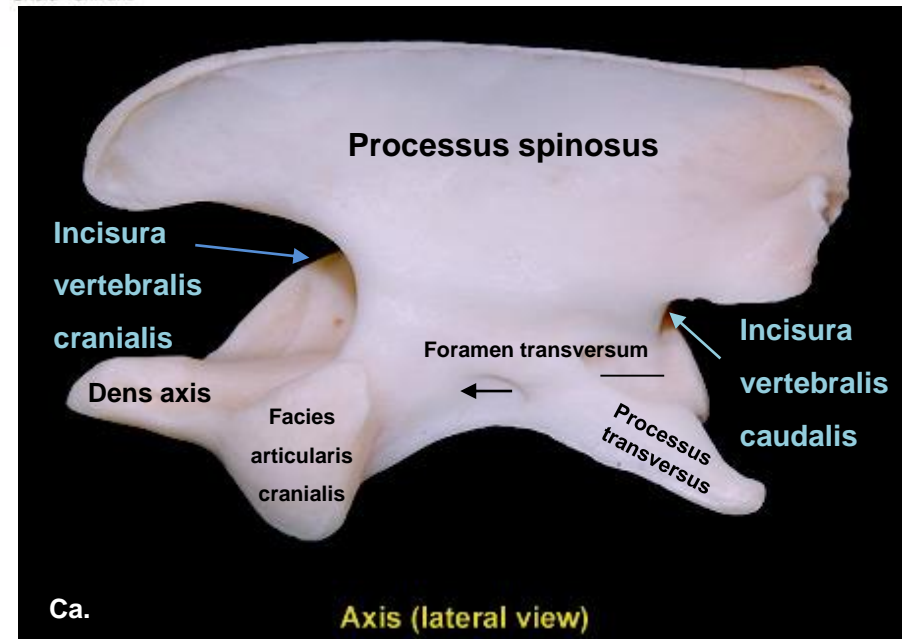
d. caudally – INCISURA VERTEBRALIS CAUDALIS



C2 (Axis), Ca.



http://www.onemedicine.tuskegee.edu/CanineOsteology/Vertebral_column/C-axis.html



THE VERTEBRAL BODY (CORPUS VERTEBRAE)

7. INTERVERTEBRAL FORAMEN (FORAMEN INTERVERTEBRALE) formed by:

1. INCISURA VERTEBRALIS CRANIALIS

2. INCISURA VERTEBRALIS CAUDALIS

- the notches of the adjacent vertebrae come together to form the intervertebral foramen
- the intervertebral foramen serves as an exit for the spinal nerves



<https://opentextbc.ca/anatomyandphysiology/chapter/7-3-the-vertebral-column/>

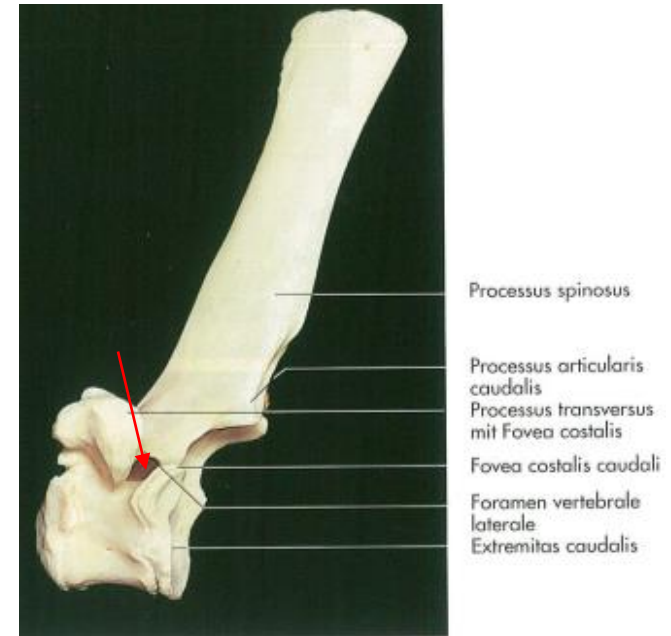
Ca., lumbal vertebrae, lateral aspect

THE VERTEBRAL BODY (CORPUS VERTEBRAE)

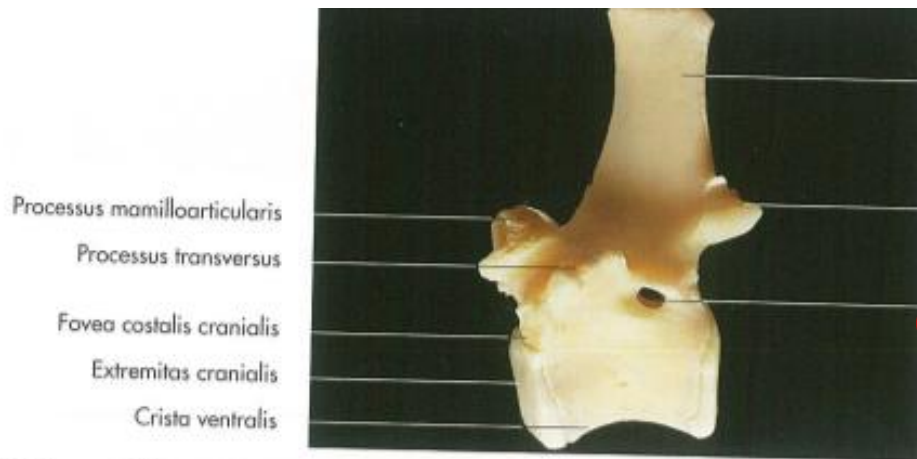
INCISURA VERTEBRALIS CAUDALIS

IN BOVINE:

- divided by a bony bridge
- called **foramen vertebrale laterale** also



Th vertebra



Th13

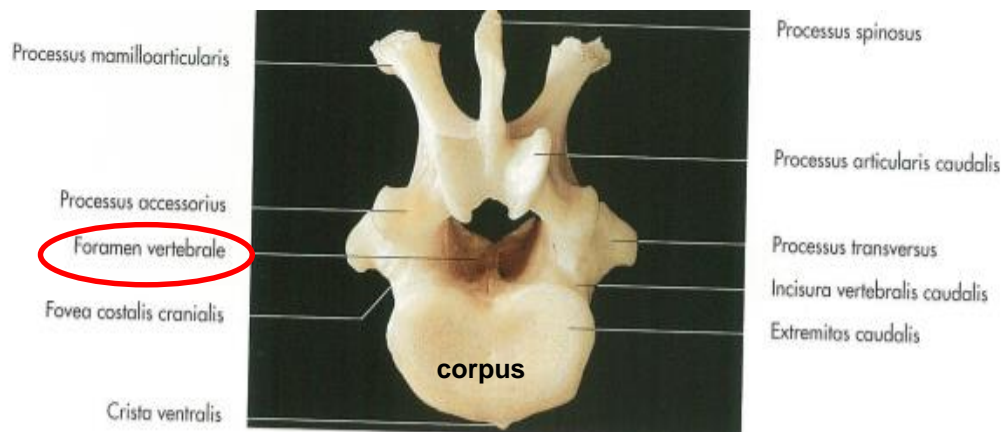
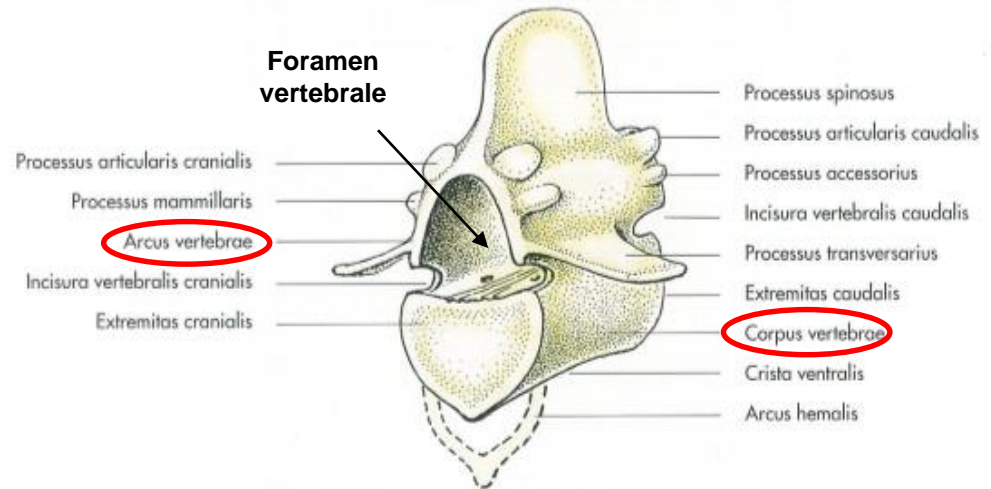
Processus spinosus
Processus articularis caudalis

Incisura vertebralis caudalis
(durch Knochensteg geschlossen)
bridged by a bony structure

THE VERTEBRAL BODY (CORPUS VERTEBRAE)

8. VERTEBRAL FORAMEN (FORAMEN VERTEBRALE) formed by:

- a) the vertebral body
- b) the vertebral arch
- situated centrally

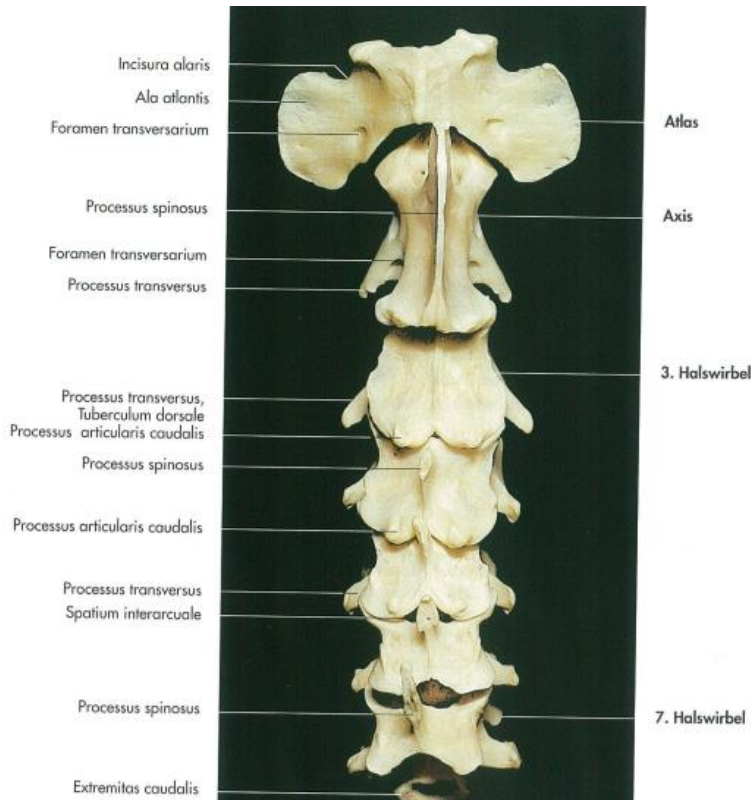


Vertebra thoracica (Th13) , Ca., caudal aspect

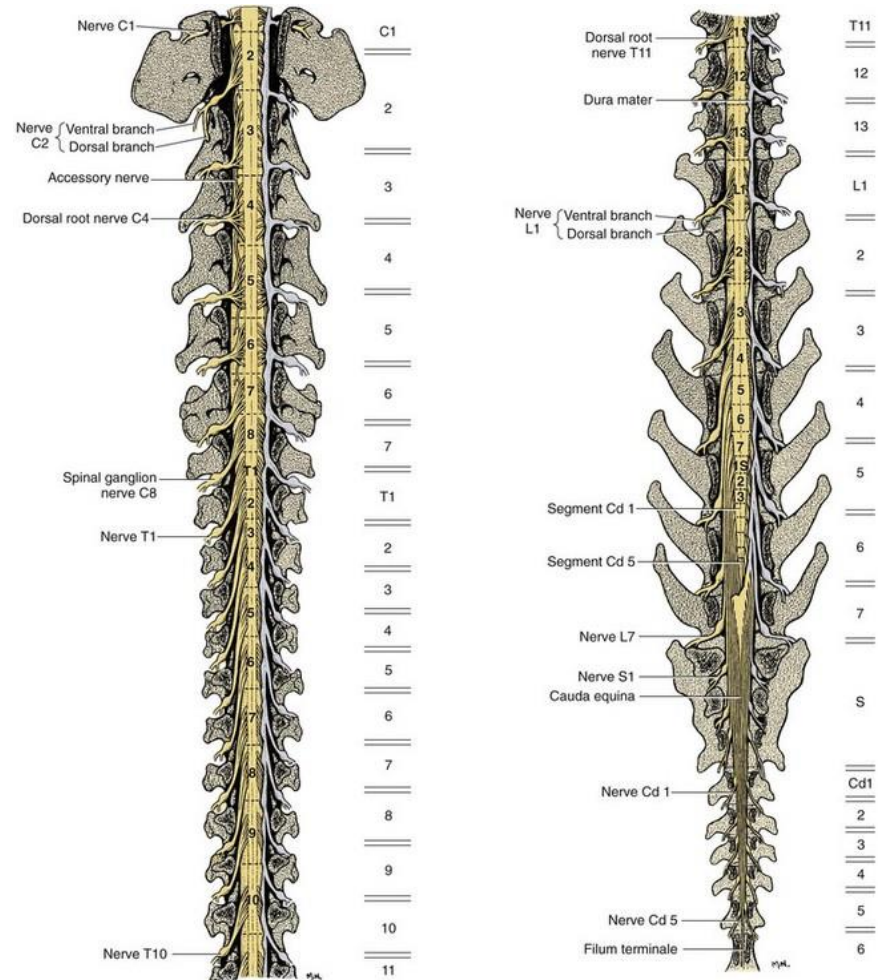
THE VERTEBRAL BODY (CORPUS VERTEBRAE)

9. VERTEBRAL CANAL (CANALIS VERTEBRALIS) formed by:

- a) the vertebral foramina of all vertebrae
- lodges the spinal cord



Cervical vertebrae, Ca., dorsal aspect

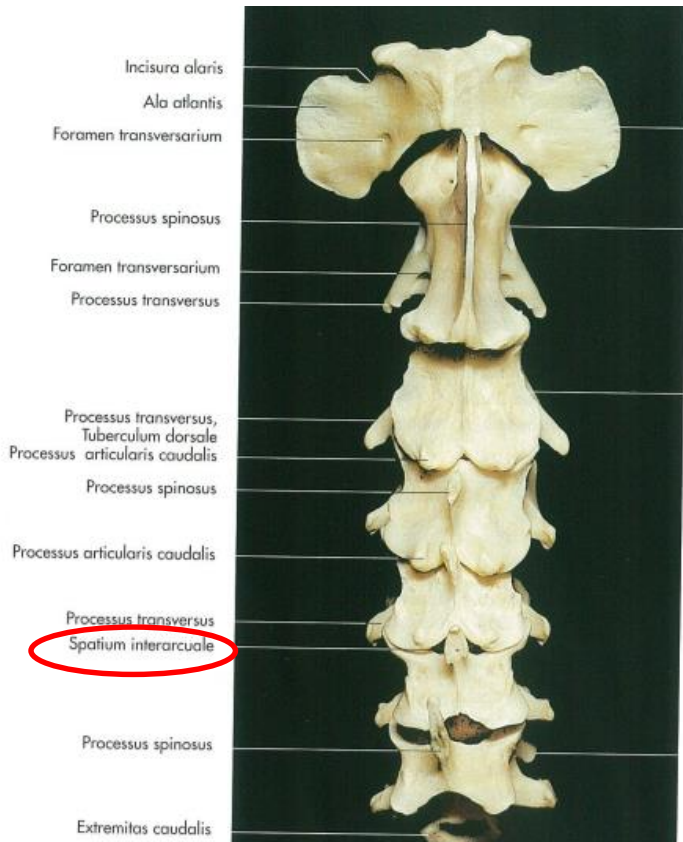
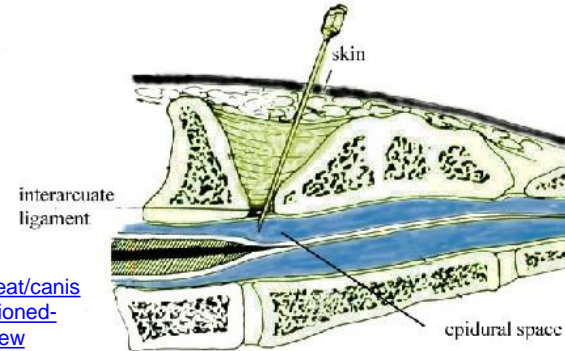


Normal spinal cord anatomy in dogs. From Fletcher TF, *et al.* Anatomical studies on the spinal cord segments of the dog. *Am J Vet Res* 1966;27:1759-1767.

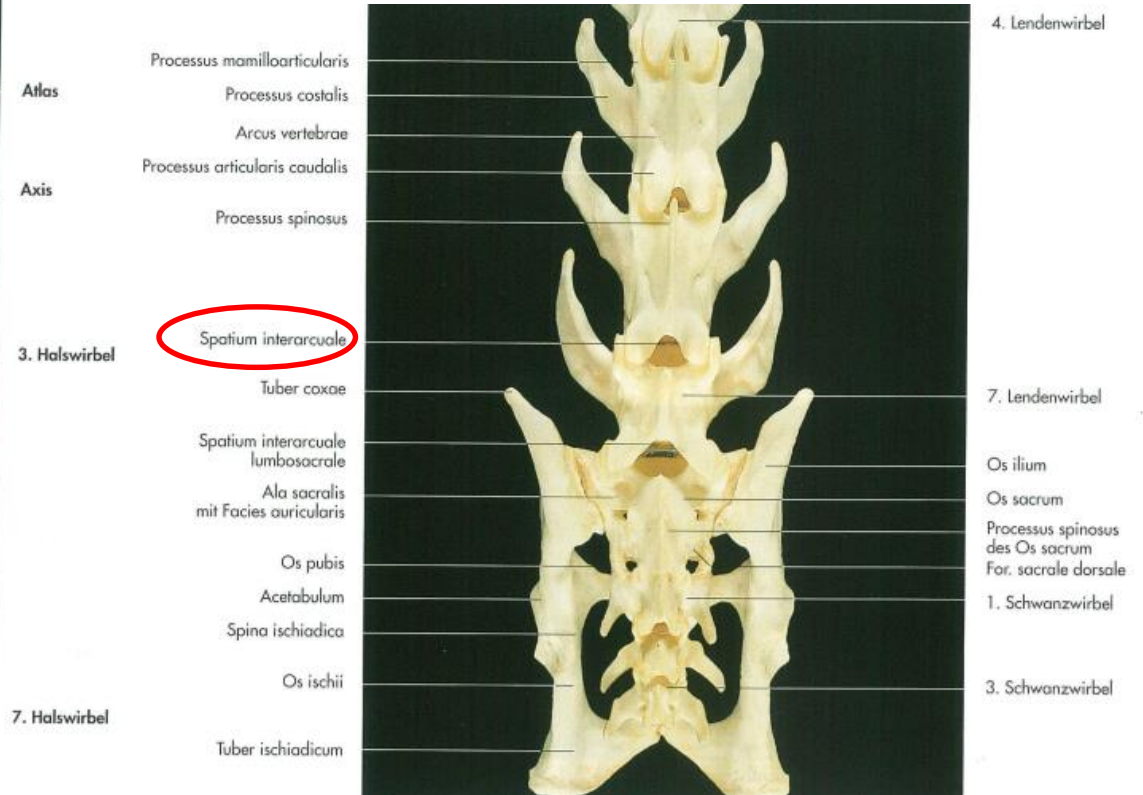
INTERARCUATE SPACE (SPATIUM INTERARCUALE)

- between the vertebral arches
- clinical importance
- accessible for injection, punction

<https://www.vetstream.com/treat/canis/illustration/epidural-dog-positioned-for-epidural-restraint-lateral-view>



Cervical vertebrae, Ca., dorsal aspect



Last lumbar vertebrae, Fe., dorsal aspect

INTERARCUATE SPACE (SPATIUM INTERARCUALE)

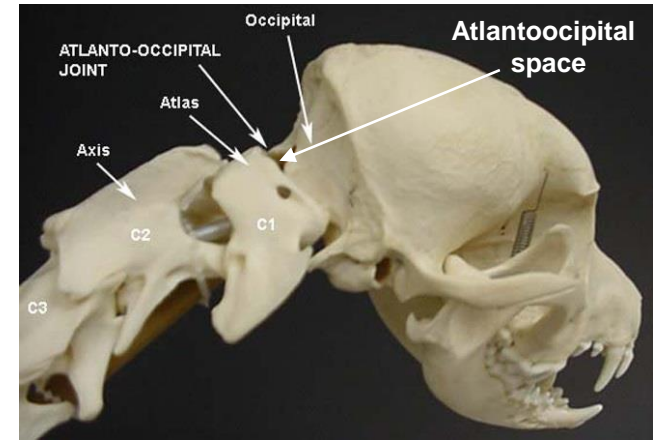
A. ATLANTOCCIPITAL SPACE (SPATIUM ATLANTOCCIPITALE)

- between the occipital bone and the atlas

B. ATLANTOAXIAL SPACE (SPATIUM ATLANTOAXIALE)

- between atlas and axis

<https://cavalierhealth.org/sm2.htm>



Scapula
1. Brustwirbel
Processus spinosus
des 7. Halswirbels
Processus articularis cauda
des 4. Halswirbels
Foramen intervertebrale
Corpus vertebrae des 7.
Halswirbels
Trachea

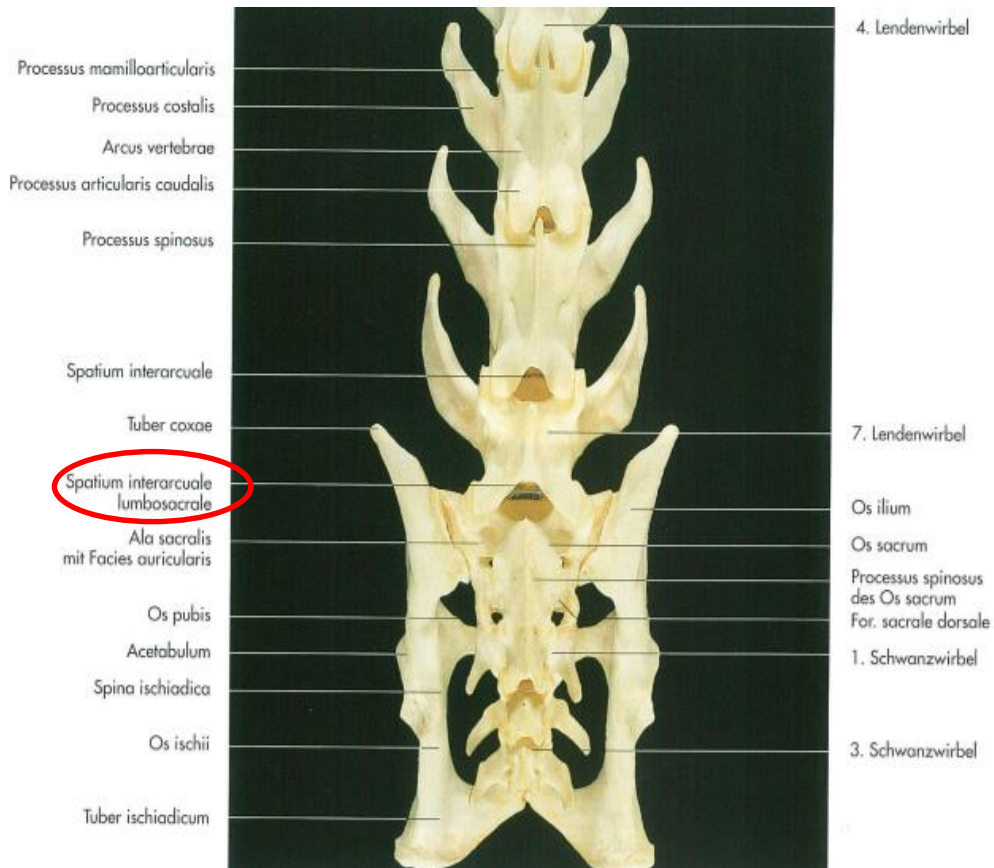
<http://www.vetpixel.com/en/cas/20-a-case-of-atlanto-axial-instability-in-a-small-dog>

Radiograph of the cervical spine of the dog, lateral aspect

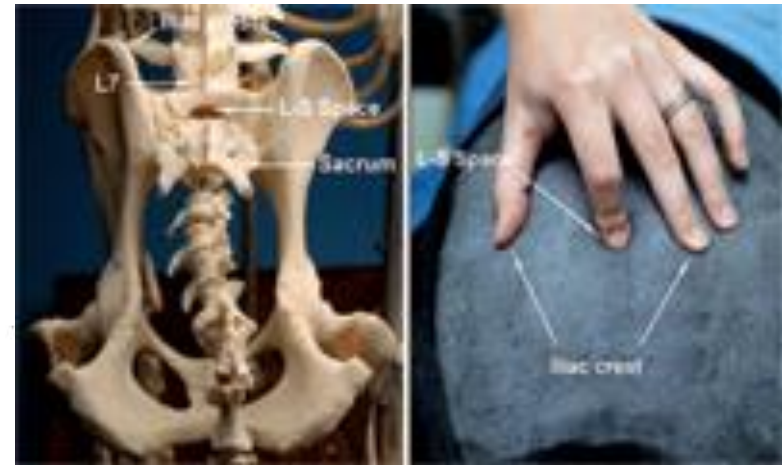
INTERARCUATE SPACE (SPATIUM INTERARCUALE)

C. LUMBOSACRAL SPACE (SPATIUM LUMBOSACRALE)

- between the last lumbar and first sacral vertebra



Last lumbal vertebrae, Fe., dorsal aspect



<https://veterinarymedicine.dvm360.com/local-and-regional-anesthesia-techniques-part-4-epidural-anesthesia-and-analgesia?id=&sk=&date=&pageID=4>

INTERARCUATE SPACE (SPATIUM INTERARCUALE)

D. Space between the last sacral vertebra and the first coccygeal vertebra

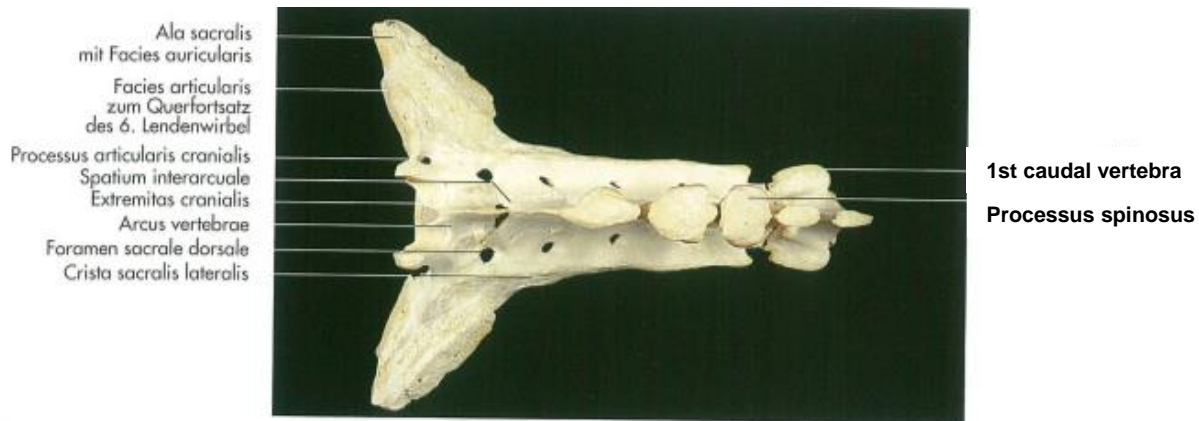


Abb. 1-85. Kreuzbein eines Pferdes (Dorsalansicht).
Sacrum of horse, dorsal aspect

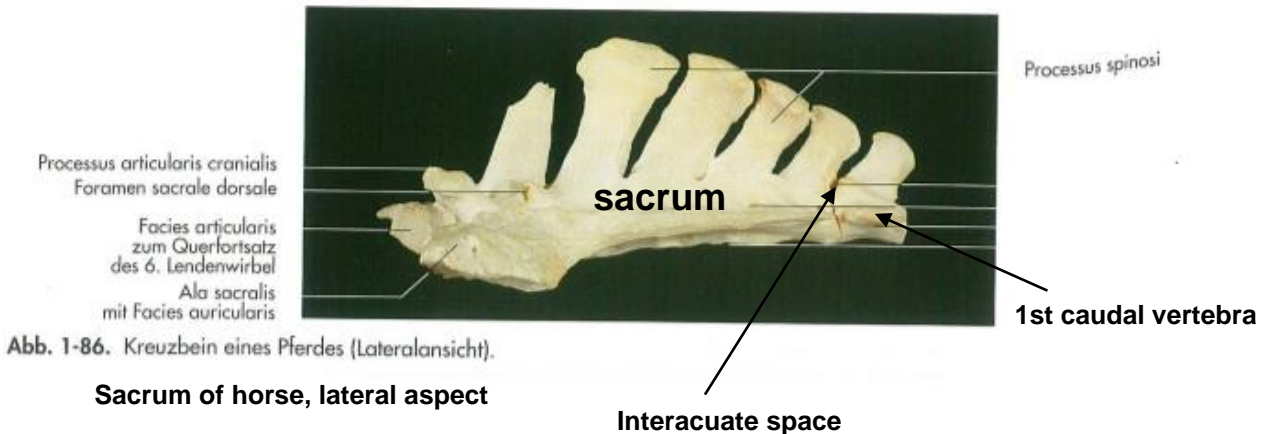


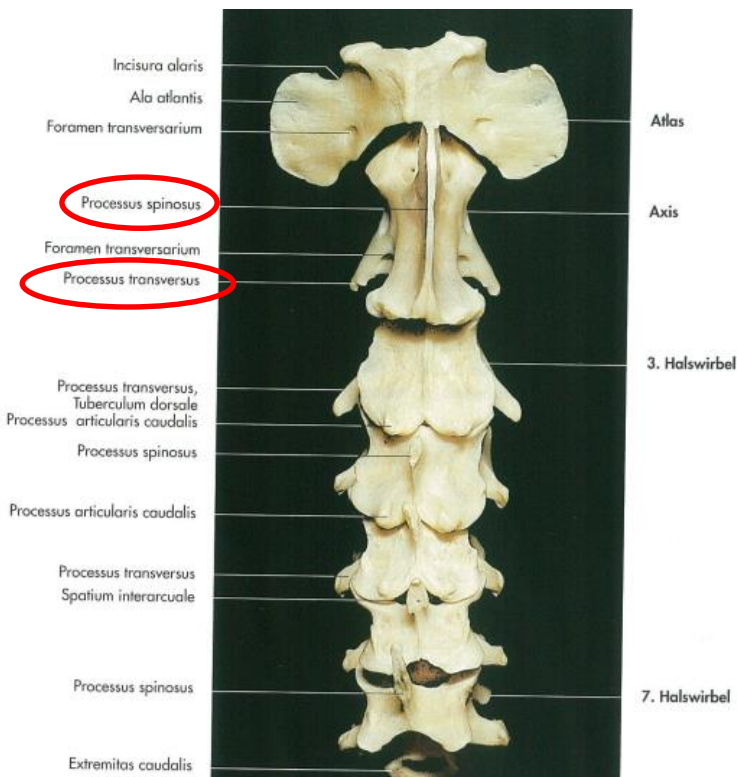
Abb. 1-86. Kreuzbein eines Pferdes (Lateralansicht).

Sacrum of horse, lateral aspect

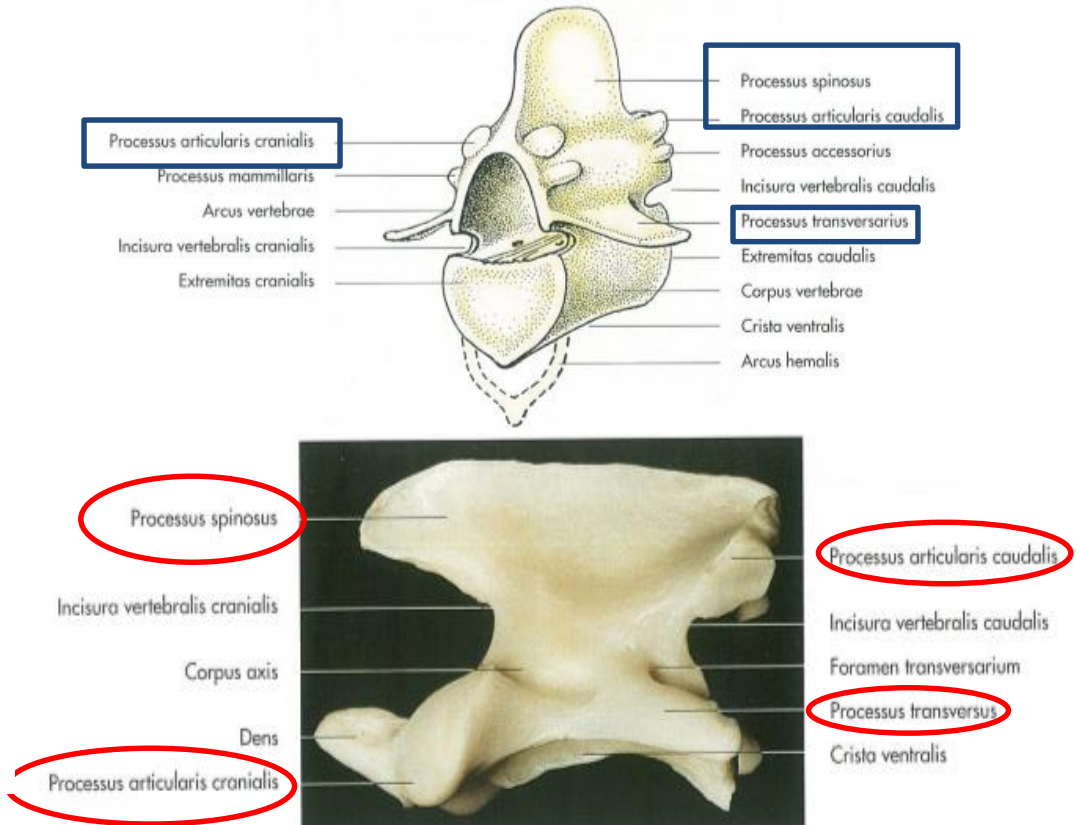
VERTEBRAL PROCESSES (PROCESSUS VERTEBRALIS)

each vertebra has:

1. one spinous process (PROCESSUS (PROC.) SPINOSUS)
2. two transverse processes (PROC. TRANSVERSI)
3. two pairs of cranial articular processes (PROCC. ARTICULARES (Zygopophyses) CRANIALES)
4. two pairs of caudal articular processes (PROCC. ARTICULARES (Zygopophyses) CAUDALES)



Cervical vertebrae, Ca., dorsal aspect

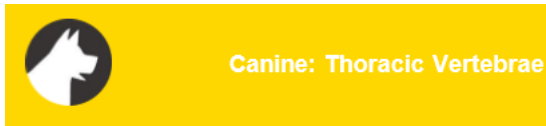
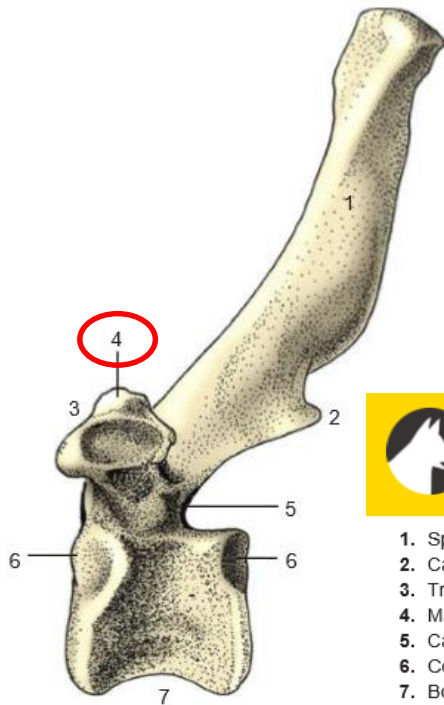
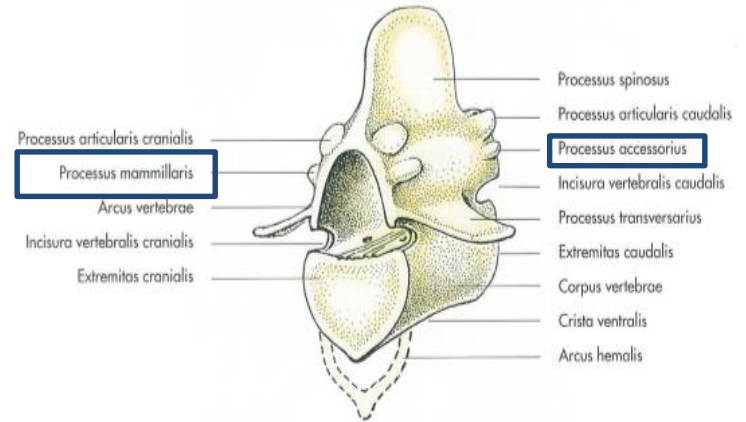


C2 (Axis), Ca.

VERTEBRAL PROCESSES (PROCESSUS VERTEBRALIS)

5. mamillary processes (PROCC. MAMILLARES) :

- on the thoracic and lumbar vertebrae
- situated between the cranial articular and the transverse process



1. Spinous process
2. Caudal articular process
3. Transverse process with costal fovea
4. Mammillary process
5. Caudal vertebral notch
6. Costal foveae
7. Body

Note: Left, lateral view.



Th vertebra, Su., left lateral aspect

VERTEBRAL PROCESSES (PROCESSUS VERTEBRALIS)

6. accessory processes (PROCC. ACCESSORI) :

- on the thoracic and lumbar vertebrae **in carnivore**
- situated between the caudal articular and the transverse process



Abb. 1-66. 13. Brustwirbel eines Hundes (Lateralsicht). **Lateral aspect**

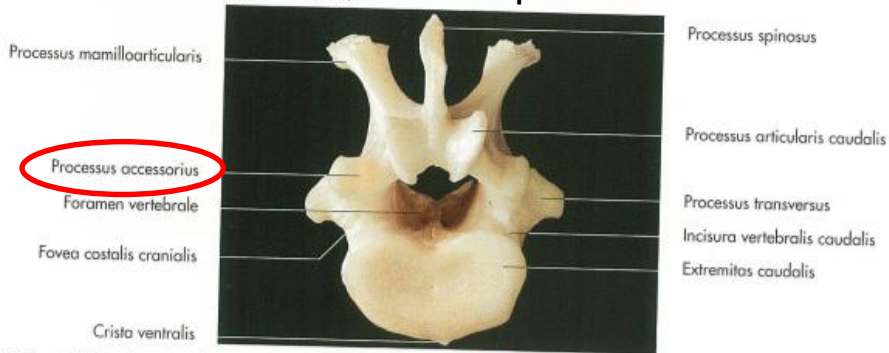
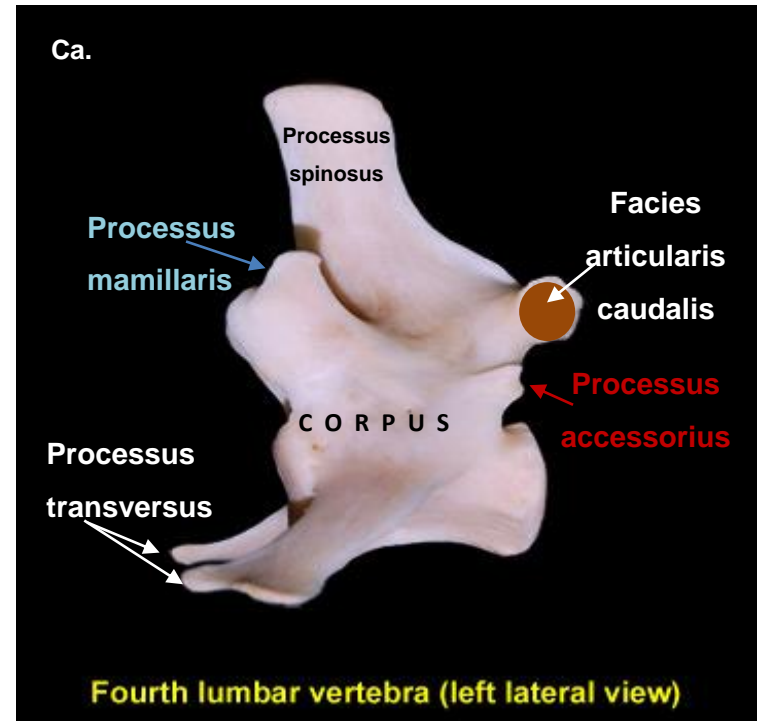


Abb. 1-67. 13. Brustwirbel eines Hundes (Kaudalsicht).

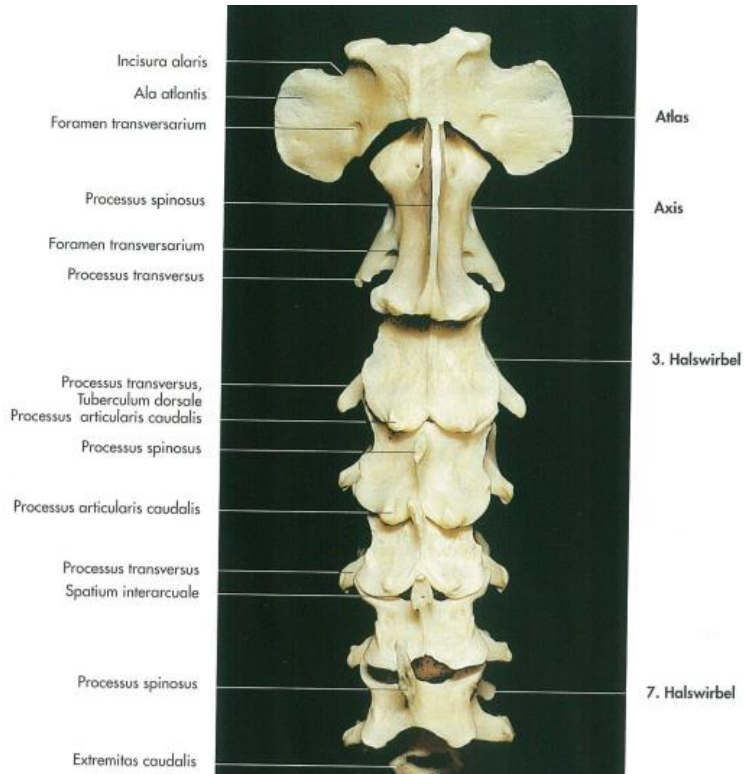
Thoracal vertebra, Ca, caudal aspect



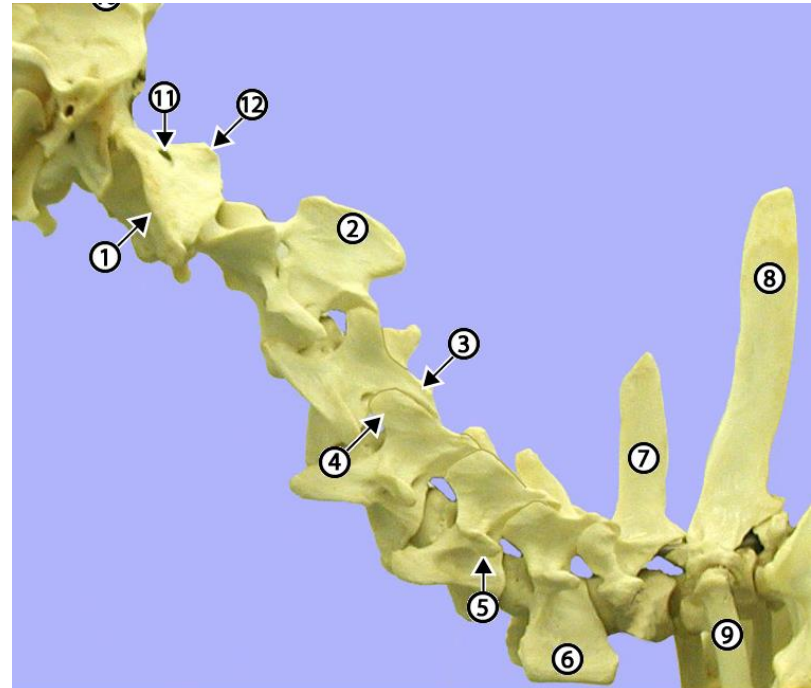
Fourth lumbar vertebra (left lateral view)

CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

- all mammalian species possess seven (C1 – C7) cervical vertebrae
- the 1st and the 2nd cervical vertebrae facilitate free movement of the head



Cervical vertebrae, Ca., dorsal aspect



Bovine cervical vertebrae. 1, wing of atlas (C1); 2, spinous process of axis (C2); 3, caudal articular process of C3; 4, cranial articular process of C4; 5, lateral part of transverse process of C5; 6, ventral part of transverse process of C6; 7, spinous process of C7; 8, spinous process of T1; 9, first rib; 10, skull; 11, combined lateral vertebral and alar foramen; 12, dorsal arch of atlas (C1).

<http://vanat.cvm.umn.edu/ungDissect/Lab08/Img8-2.html>

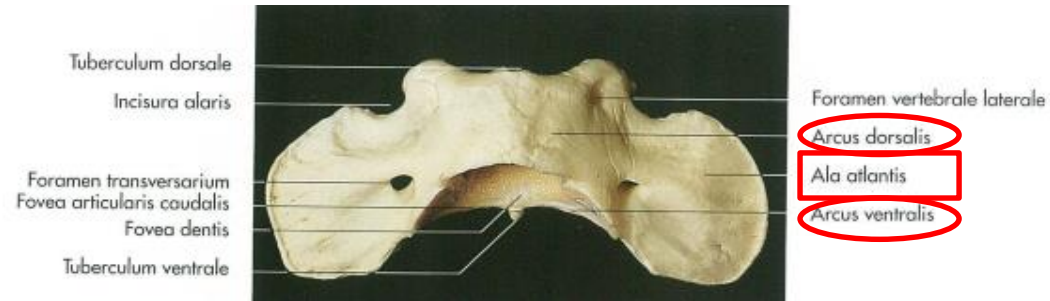
CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

1st CERVICAL VERTEBRA (ATLAS , C1):

- „carrier of the head”

composed of:

1. **NO CORPUS**
2. **dorsal arch (ARCUS DORSALIS)**
3. **ventral arch (ARCUS VENTRALIS)**
4. **MASSA LATERALIS**
5. **ALA ATLANTIS (wing)**
6. **VENTRAL SURFACE** of the wing



C1, Ca., dorsal aspect



C1, Bo., dorsal aspect



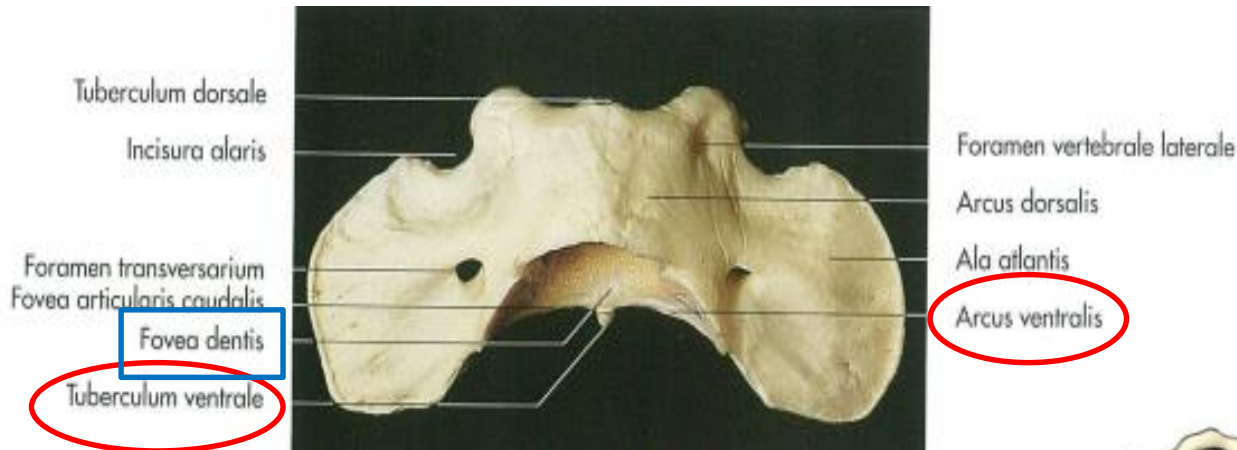
C1, Eq., dorsal aspect

CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

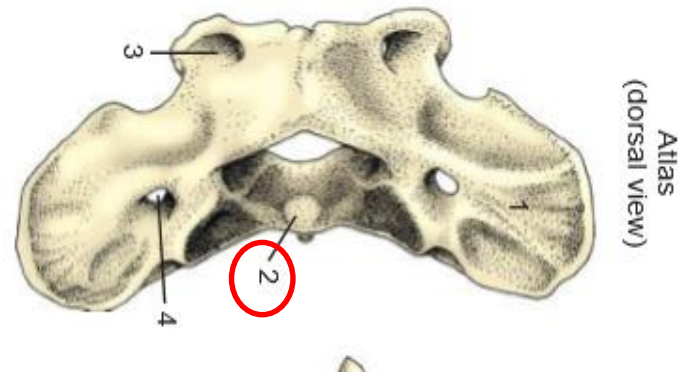
1st CERVICAL VERTEBRA (ATLAS , C1):

VENTRAL ARCH (ARCUS VENTRALIS):

- a) carries the TUBERCULUM VENTRALE
- b) its internal surface bears the FOVEA DENTIS – for articulation with the dens axis



C1, Ca., dorsal aspect



Canine: Cervical Vertebrae

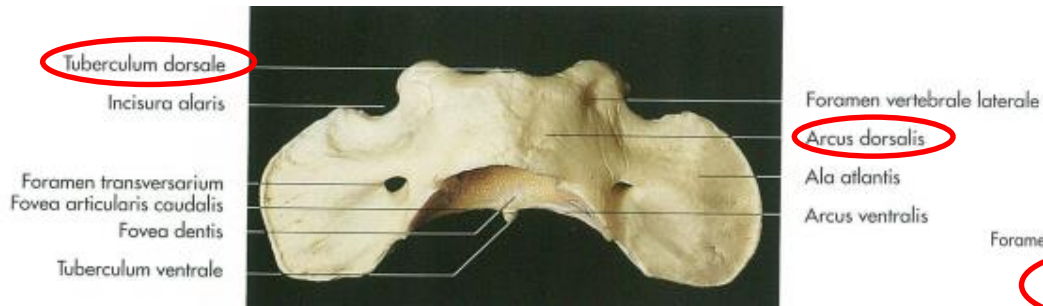
1. Wing of atlas
2. Fovea dentis
3. Lateral vertebral foramen
4. Transverse foramen

CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

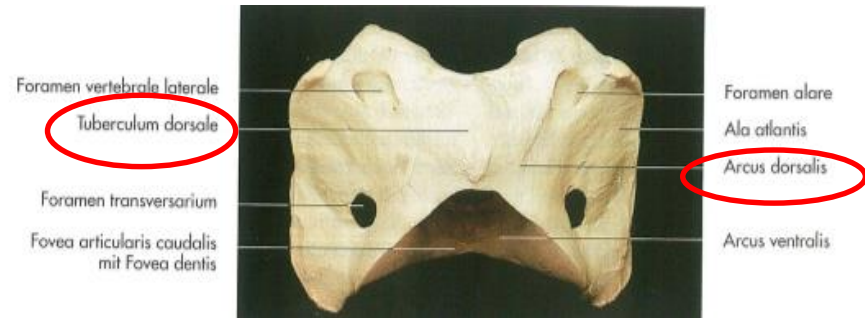
1st CERVICAL VERTEBRA (ATLAS , C1)

DORSAL ARCH (ARCUS DORSALIS):

- carries the TUBERCULUM DORSALE – modified spinous process



C1, Ca., dorsal aspect



C1, Eq., dorsal aspect



C1, Bo., dorsal aspect

CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

1st CERVICAL VERTEBRA (ATLAS , C1):

FOSSA ATLANTIS (ATLANTAL FOSSA):

- the VENTRAL SURFACE of the wing is excavated to form the FOSSA ATLANTIS

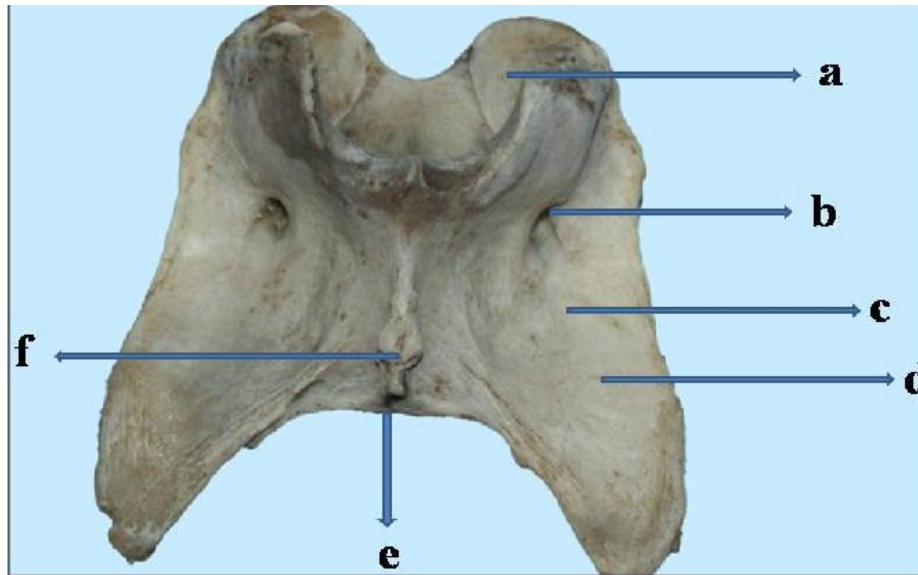


Fig. 2: Ventral view of Atlas of adult male Blue bull (*Boselaphus tragocamelus*) showing (a) Anterior articular cavity, (b) Foramen in fossa atlantis, (c) **Fossa atlantis**, (d) Wing and (e) Articular surface of ventral arch and (f) Ventral tubercle

CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

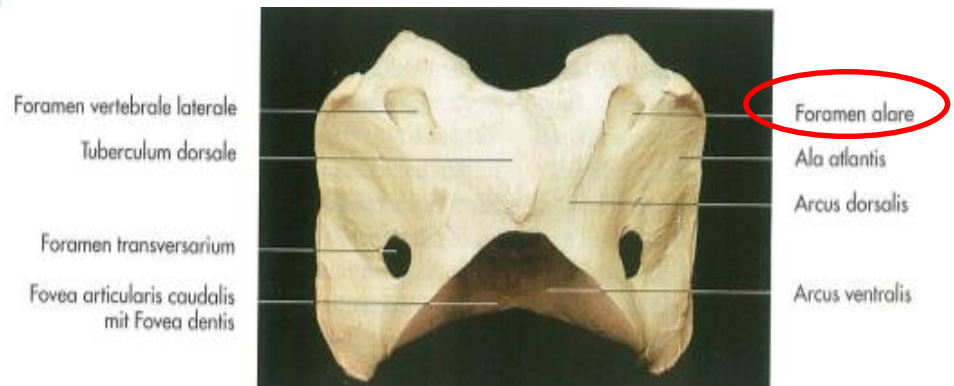
1st CERVICAL VERTEBRA (ATLAS , C1):

FORAMEN ALARE:

- in Eq, Bo, Su
- the root of the ala atlantis is pierced by the foramen alare
- the foramen alare leads into the atlantal fossa



C1, Bo., dorsal aspect



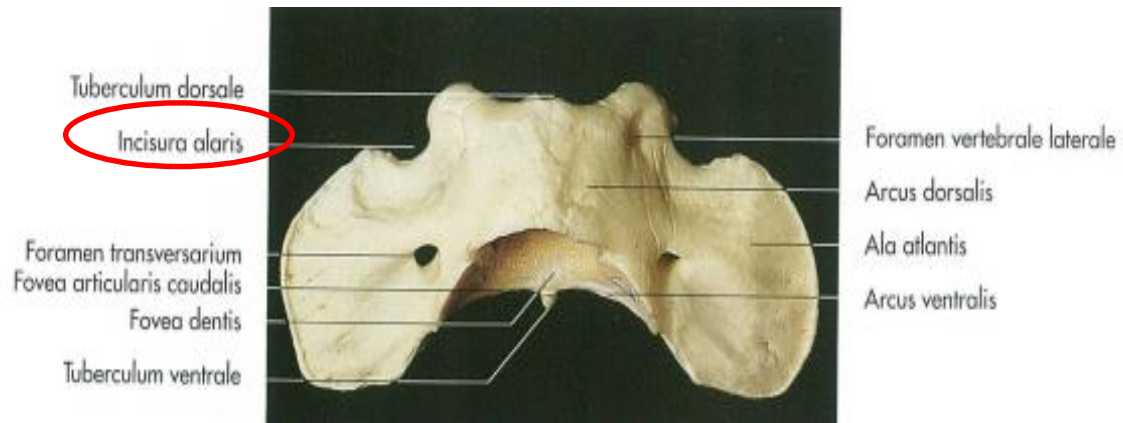
C1, Eq., dorsal aspect

CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

1st CERVICAL VERTEBRA (ATLAS , C1):

in Carnivores:

- ALAR NOTCH (INCISURA ALARIS)



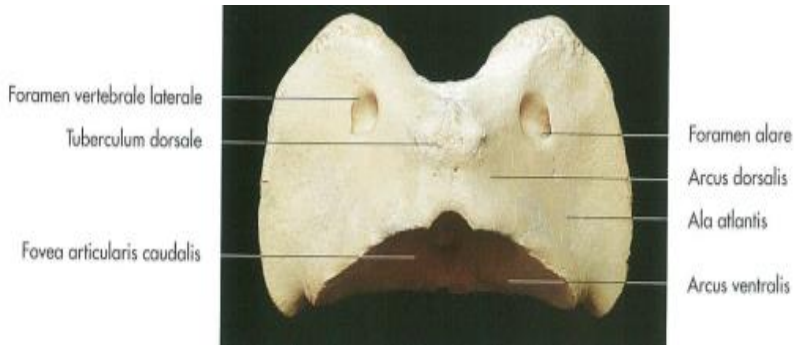
C1, Ca., dorsal aspect

CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

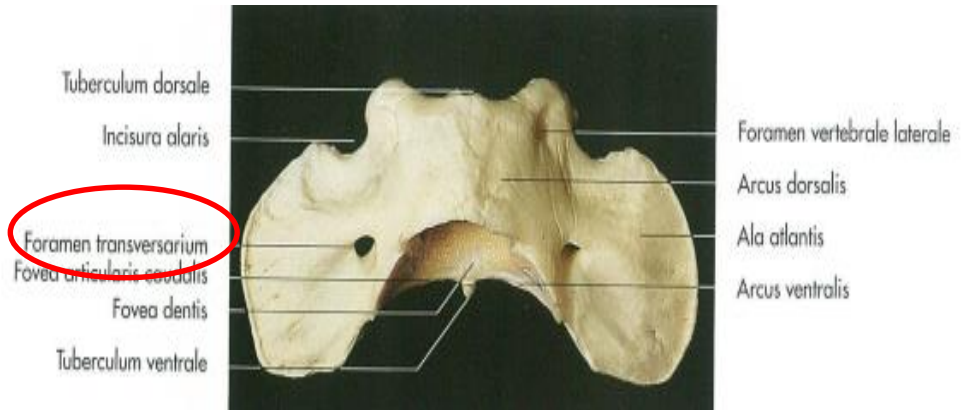
1st CERVICAL VERTEBRA (ATLAS , C1):

TRANSVERSE FORAMEN (FORAMEN TRANSVERSARIUM):

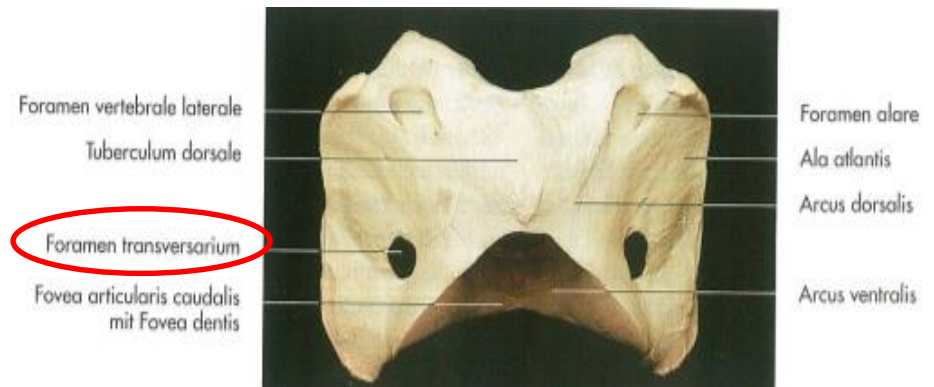
- the wing is perforated caudally by the transverse foramen
- **in Ca, Eq**
- **except in ruminants**



C1, Bo., dorsal aspect



C1, Ca., dorsal aspect



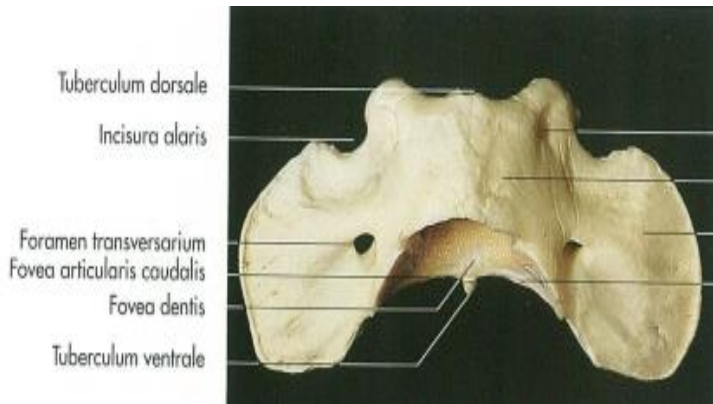
C1, Eq., dorsal aspect

CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

1st CERVICAL VERTEBRA (ATLAS , C1):

LATERAL VERTEBRAL FORMAMEN (FORAMEN VERTEBRALE LATERALE):

- medial exit of the vertebral canal from the alar foramen



C1, Ca., dorsal aspct

Foramen vertebrale laterale

Arcus dorsalis

Ala atlantis

Arcus ventralis

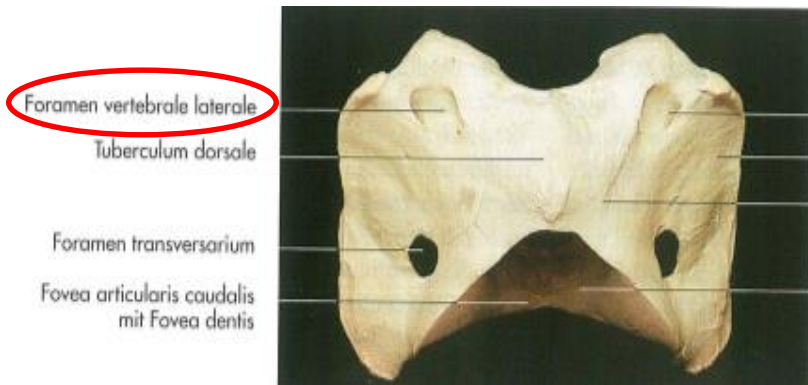


C1, Bo., dorsal aspect

Foramen vertebrale laterale

tuberculum dorsale

Fovea articularis caudalis



C1, Eq., dorsal aspect

Foramen alare

Ala atlantis

Arcus dorsalis

Arcus ventralis

CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

1st CERVICAL VERTEBRA (ATLAS , C1):

- the articular processes are absent

1. the cranial articular surfaces are represented by the:

a. FOVEAE ARTICULARES CRANIALES

- articulate with the occipital condyles

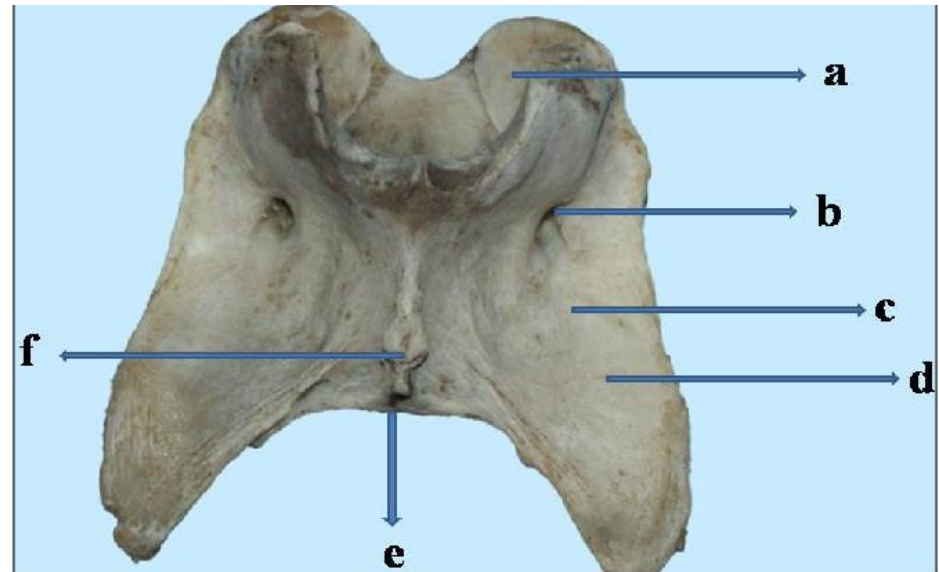
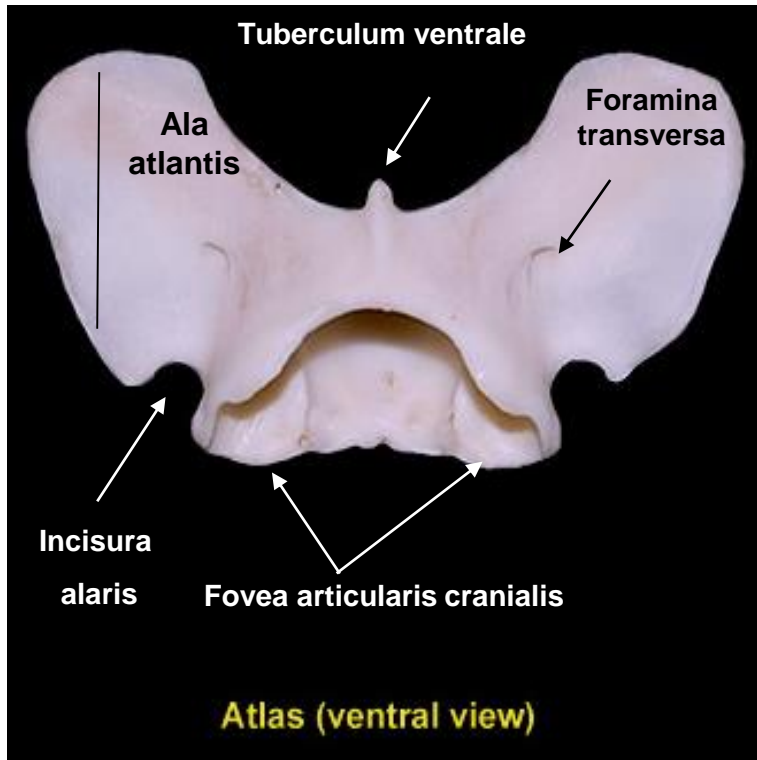


Fig. 2: Ventral view of Atlas of adult male Blue bull (*Boselaphus tragocamelus*) showing (a) Anterior articular cavity, (b) Foramen in fossa atlantis, (c) Fossa atlantis, (d) Wing and (e) Articular surface of ventral arch and (f) Ventral tubercle

[https://www.semanticscholar.org/paper/Gross-Anatomical-and-Sex-wise-Biometrical-Studies-\(-Sathapathy-Dhote/af69f9abbed30ec55ff11c75761f94142c8238c2/figure/1](https://www.semanticscholar.org/paper/Gross-Anatomical-and-Sex-wise-Biometrical-Studies-(-Sathapathy-Dhote/af69f9abbed30ec55ff11c75761f94142c8238c2/figure/1)

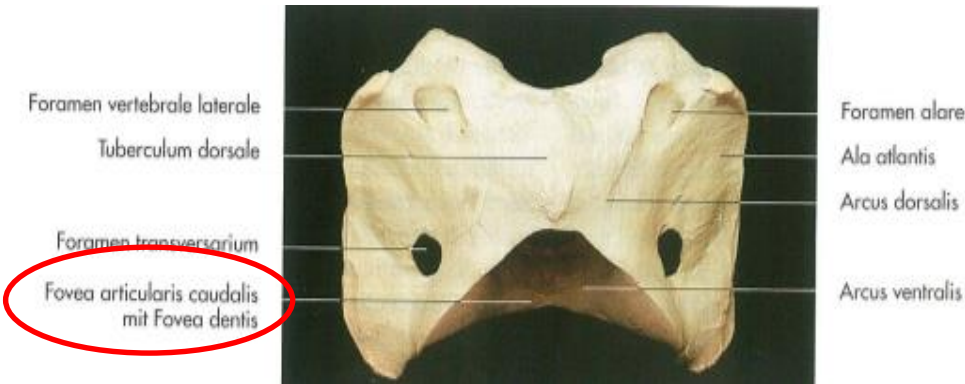
CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

1st CERVICAL VERTEBRA (ATLAS , C1):

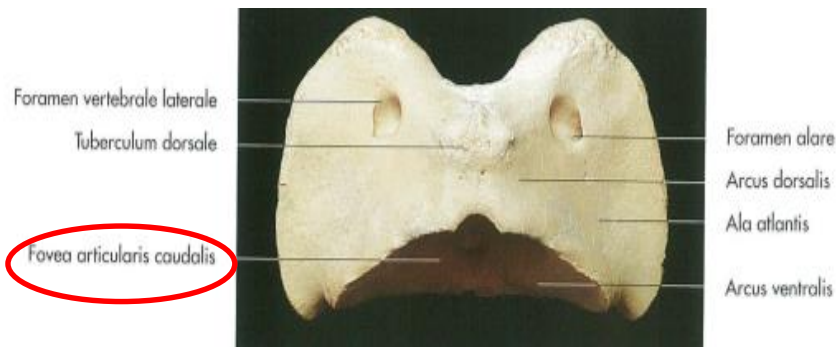
1. the caudal articular surfaces are represented by the:

a. FOVEAE ARTICULARES CAUDALES

- articulate with the processes of the axis



C1, Eq., dorsal aspect



C1, Bo., dorsal aspect

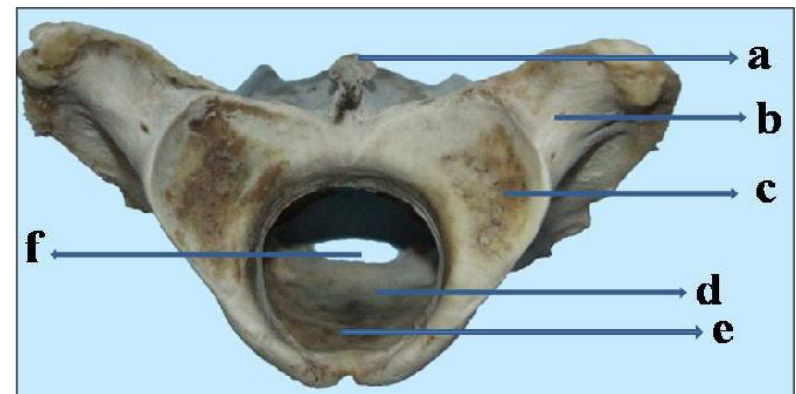


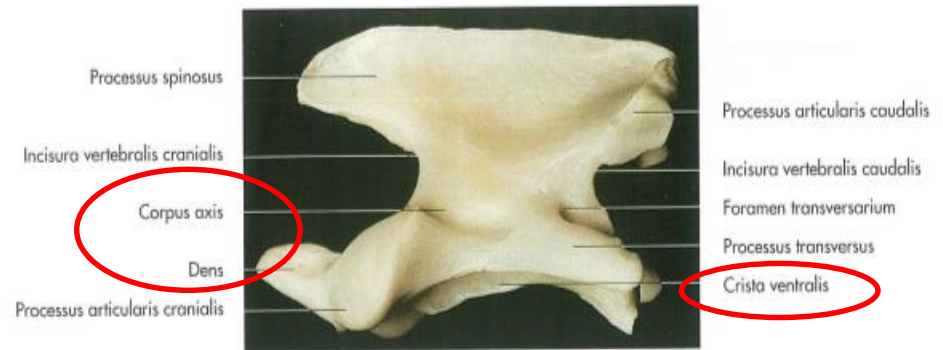
Fig. 4: Caudal view of Atlas of adult male Blue bull (*Boselaphus tragocamelus*) showing (a) Ventral tubercle, (b) Wing, (c) **Caudal articular surface**, (d) Floor of neural canal, (e) Fovea dentis and (f) Cervical vertebral foramen

[https://www.semanticscholar.org/paper/Gross-Anatomical-and-Sex-wise-Biometrical-Studies-\(Sathapathy-Dhote/af69f9abbed30ec55ff11c75761f94142c8238c2/figure/3](https://www.semanticscholar.org/paper/Gross-Anatomical-and-Sex-wise-Biometrical-Studies-(Sathapathy-Dhote/af69f9abbed30ec55ff11c75761f94142c8238c2/figure/3)

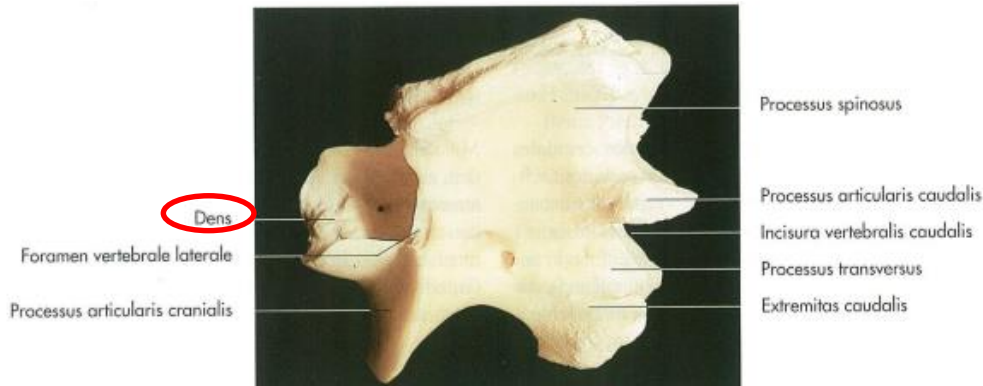
CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

2nd CERVICAL VERTEBRA (AXIS , EPISTROPHEUS, C2):

1. long body
2. prominent crista ventralis
3. DENS AXIS – tooth – like process



C2 (Axis), Ca.



C2, Bo.



C2, Eq.

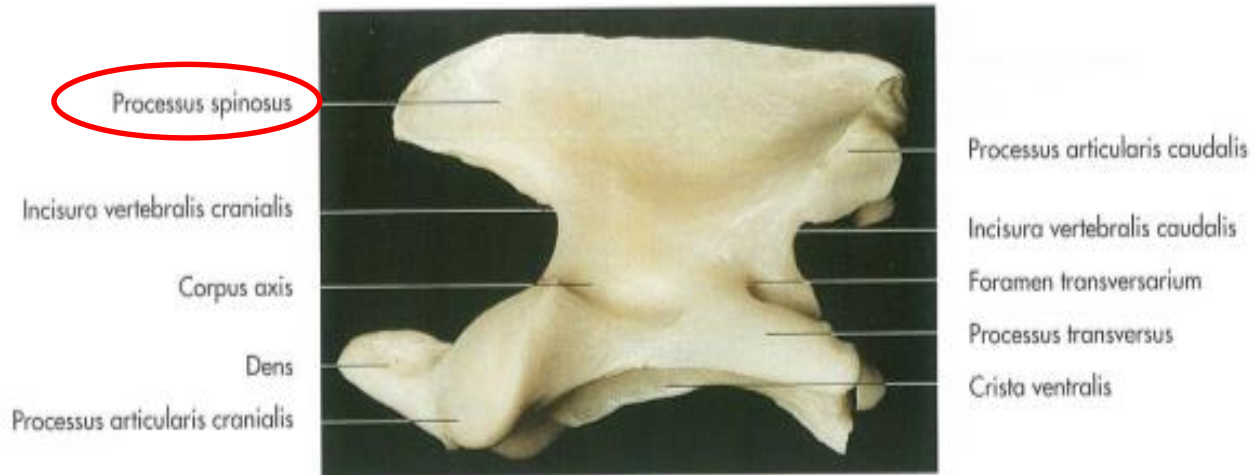
CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

2nd CERVICAL VERTEBRA (AXIS , EPISTROPHEUS, C2):

4. PROC. SPINOSUS

IN CARNIVORES:

– extends cranially and caudally



C2 (Axis), Ca.

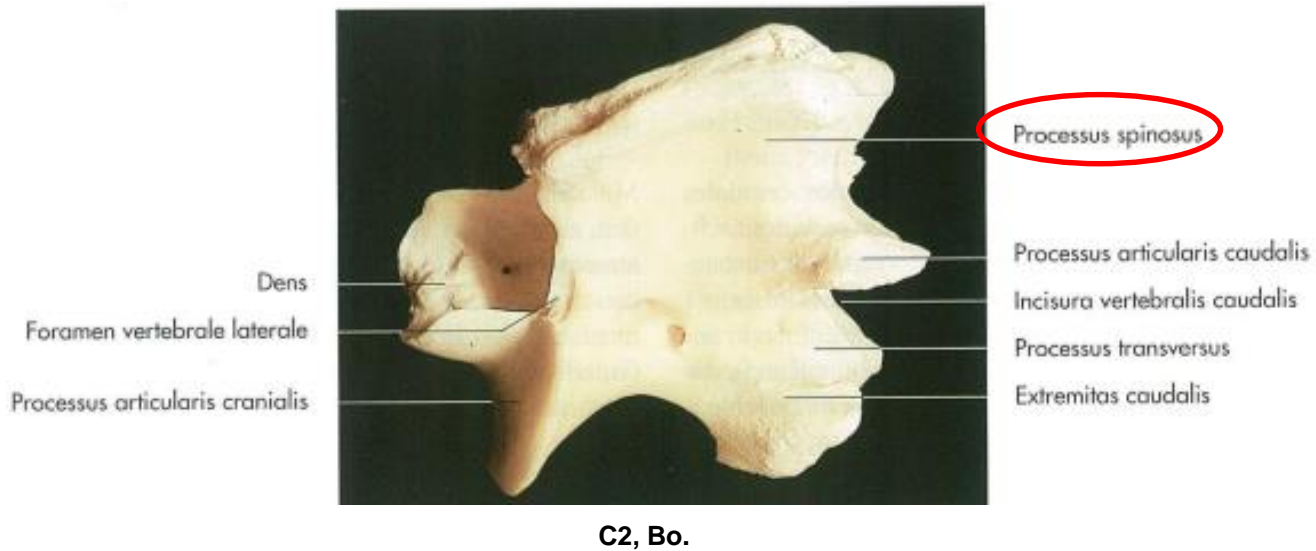
CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

2nd CERVICAL VERTEBRA (AXIS , EPISTROPHEUS, C2):

4. PROC. SPINOSUS

IN SMALL RUMINANTS, IN THE OX:

– its shape rectangular with a convex dorsal border

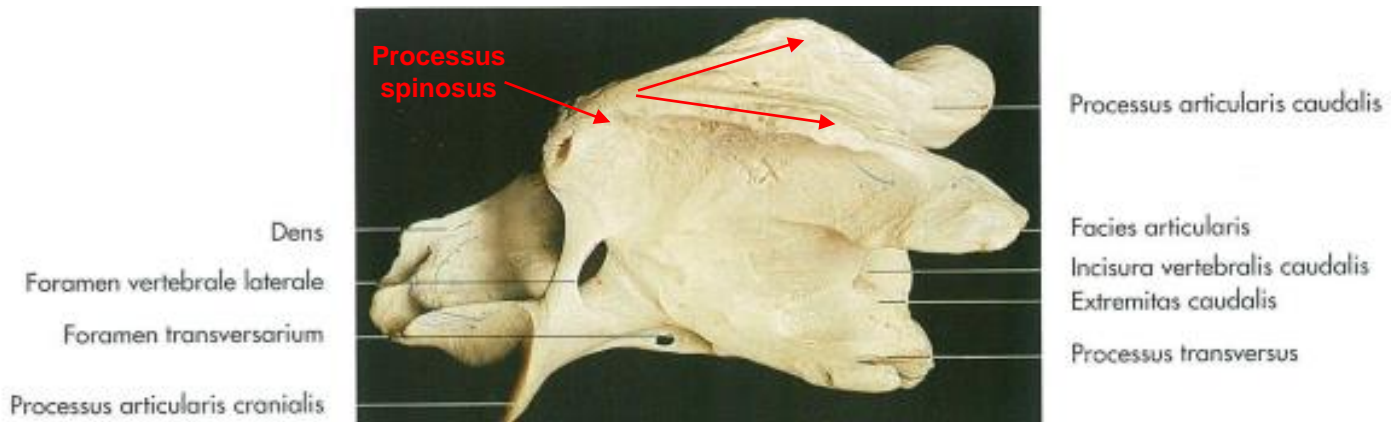


CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

2nd CERVICAL VERTEBRA (AXIS , EPISTROPHEUS, C2):

4. PROC. SPINOSUS IN HORSE

– continued caudally to the articular processes by two ridges



C2, Eq.

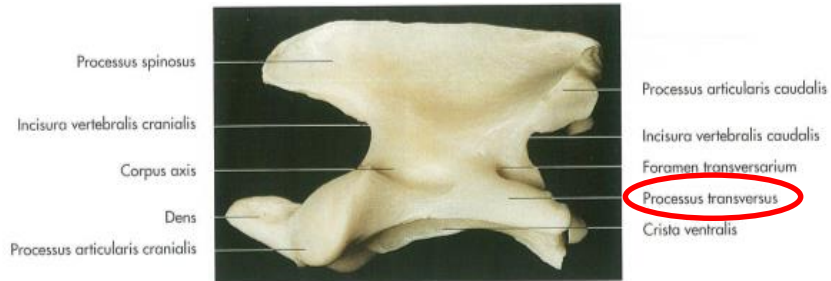


CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

2nd CERVICAL VERTEBRA (AXIS , EPISTROPHEUS, C2):

5. PROC. TRANSVERSUS:

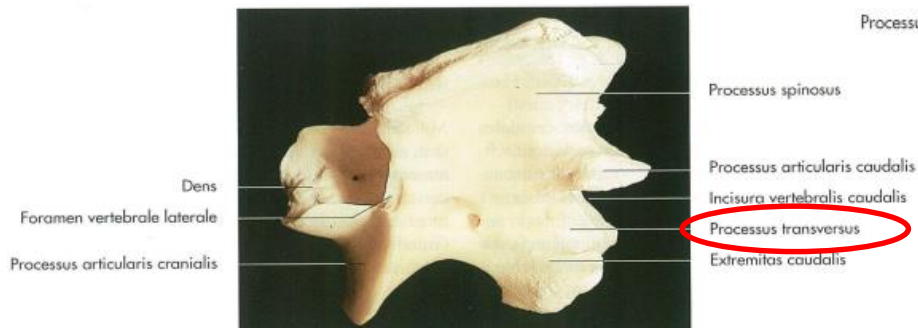
- poorly developed with only a caudal process



C2 (Axis), Ca.



C2, Eq.



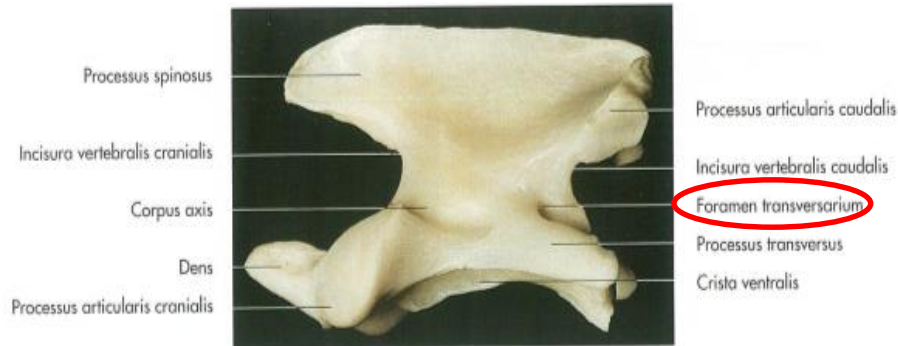
C2, Bo.

CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

2nd CERVICAL VERTEBRA (AXIS , EPISTROPHEUS, C2):

6. FORAMEN TRANSVERSARIUM

- perforates the wing of the transverse process



C2 (Axis), Ca.



C2, Eq.



Fig. 5: Lateral view of Axis of adult female Blue bull (*Boselaphus tragocamelus*) showing (a) Dorsal supraspinous process, (b) Caudal articular process, (c) Caudal opening of transverse foramen, (d) Transverse process, (e) Ventral spine, (f) Cranial opening of transverse foramen, (g) Flat articular surface of cranial end of body, (h) Dens or odontoid process and (i) Intervertebral foramen

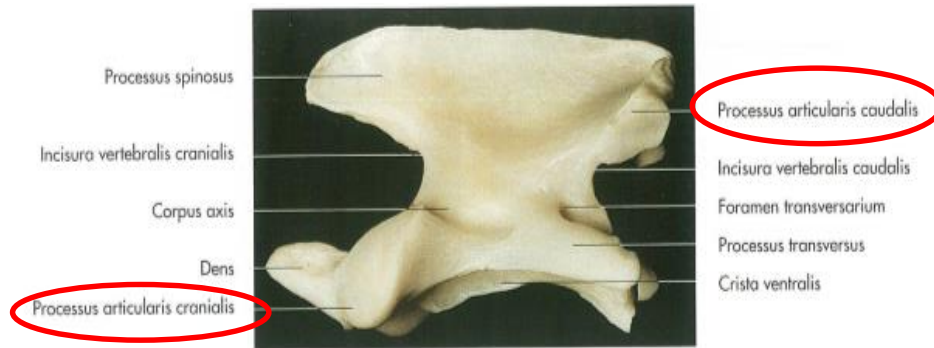
<https://pdfs.semanticscholar.org/af69/f9abbed30ec55ff11c75761f94142c8238c2.pdf>

CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

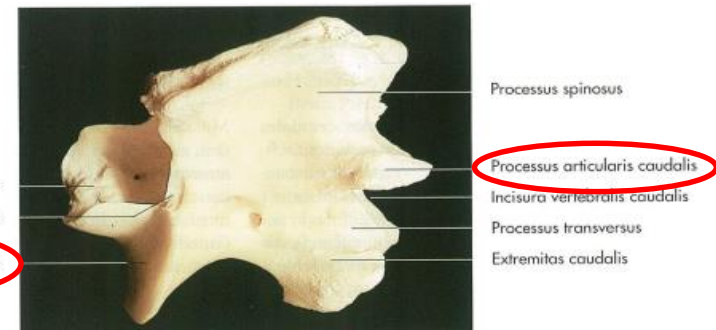
2nd CERVICAL VERTEBRA (AXIS , EPISTROPHEUS, C2):

7. PROC. ARTICULARIS CRANIALIS - Facies art. cran.

8. PROC. ARTICULARIS CAUDALIS – Facies art. caud.



C2 (Axis), Ca.



C2, Bo.



C2, Eq.

CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

2nd CERVICAL VERTEBRA (AXIS , EPISTROPHEUS, C2):

7. FACIES ARTICULARIS CRANIALIS – in. Eq. divided

8. FACIES ARTICULARIS CAUDALIS

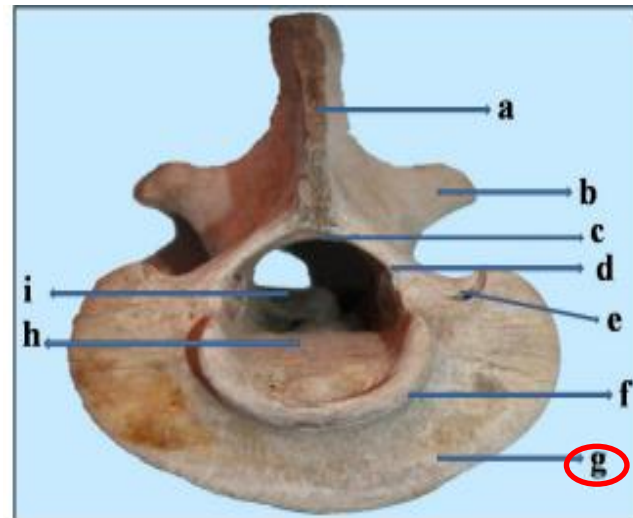
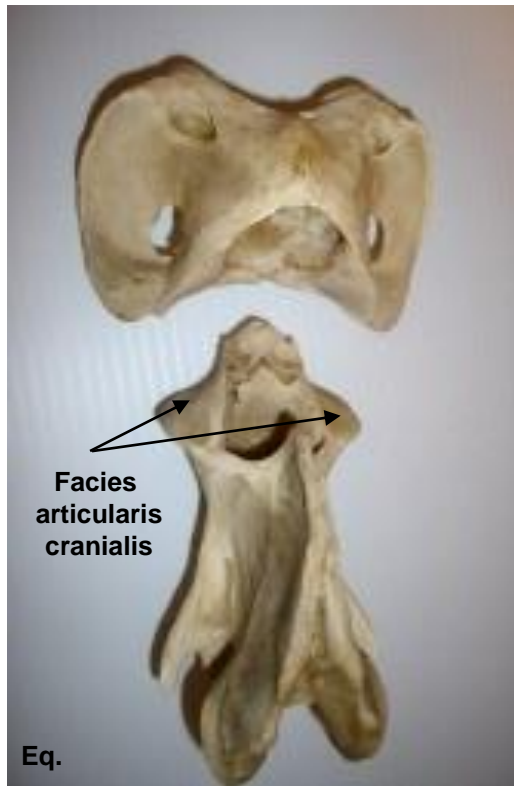


Fig. 6: Cranial view of Axis of adult female Blue bull (*Boselaphus tragocamelus*) showing (a) Dorsal supraspinous process, (b) Transverse process, (c) Laminae, (d) Pedicle, (e) Intervertebral foramen, (f) Dens or odontoid process, (g) Flat articular surface of cranial end of body, (h) Cranial aspect of floor of neural canal and (i) Caudal aspect of floor of neural canal

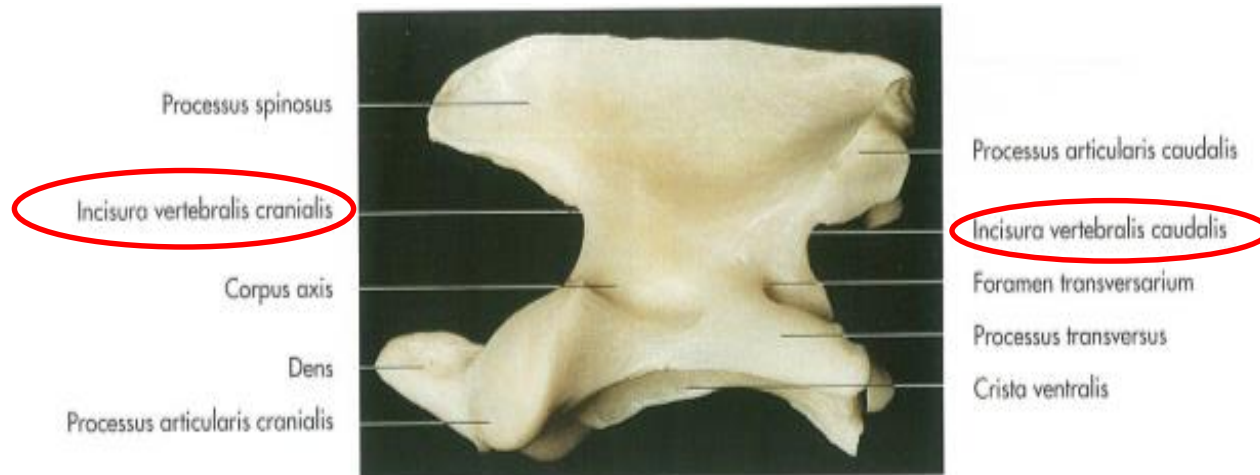
<https://pdfs.semanticscholar.org/af69/f9abbed30ec55ff11c75761f94142c8238c2.pdf>

CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

2nd CERVICAL VERTEBRA (AXIS , EPISTROPHEUS, C2):

IN CARNIVORES:

- INCISURA VERTEBRALIS CRANIALIS
- INCISURA VERTEBRALIS CAUDALIS



C2 (Axis), Ca.

CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

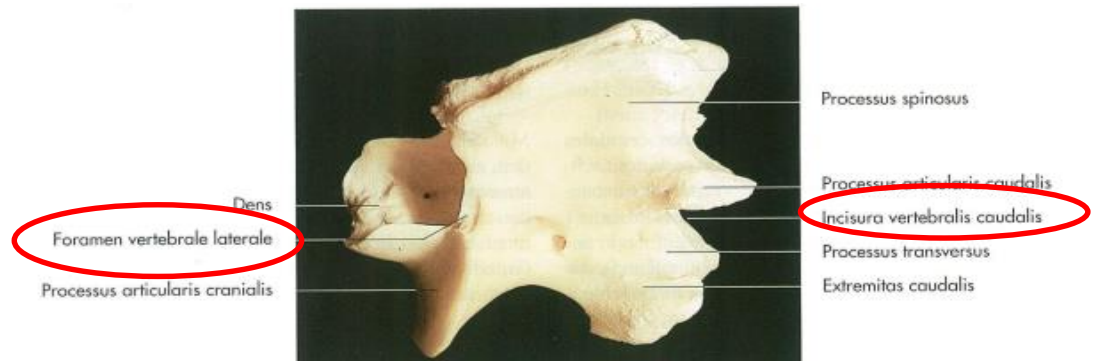
2nd CERVICAL VERTEBRA (AXIS , EPISTROPHEUS, C2):

IN Eq, Bo, Su:

- **FORAMEN VERTEBRALE LATERALE**
- **Incisura vertebralis caudalis**



C2, Eq.



C2, Bo.

CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

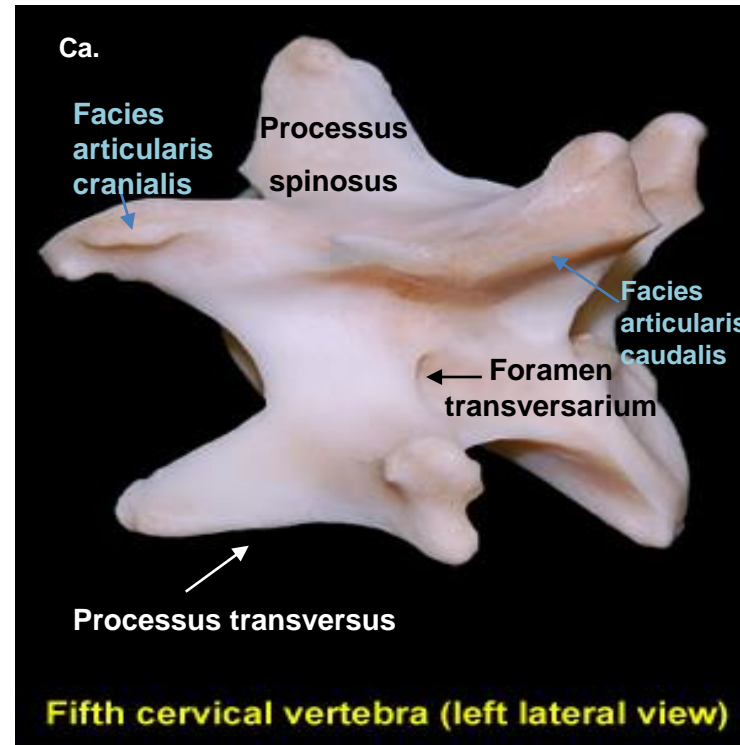
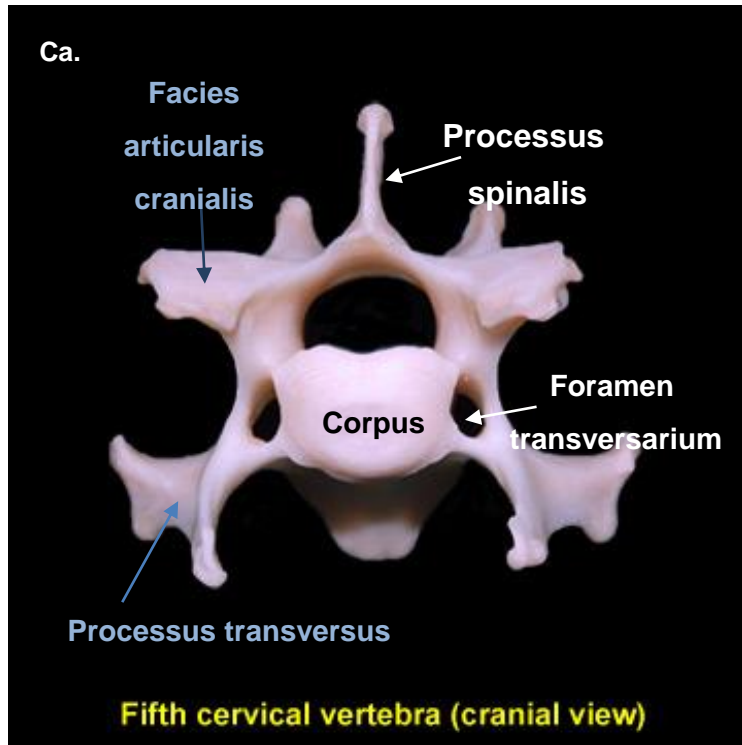
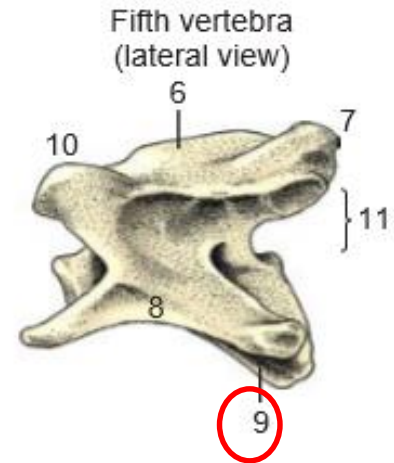
3rd - 7th CERVICAL VERTEBRAE (C3 – C7):

CORPUS VERTEBRAE:

- diminish in length towards the thorax
- the bodies of the 3rd – 7th vertebrae carry a prominent crista ventralis



1. Wing of atlas
2. Fovea dentis
3. Lateral vertebral foramen
4. Transverse foramen
5. Dens
6. Spinous process
7. Caudal articular process
8. Transverse process
9. Body
10. Cranial articular process
11. Position of vertebral foramen



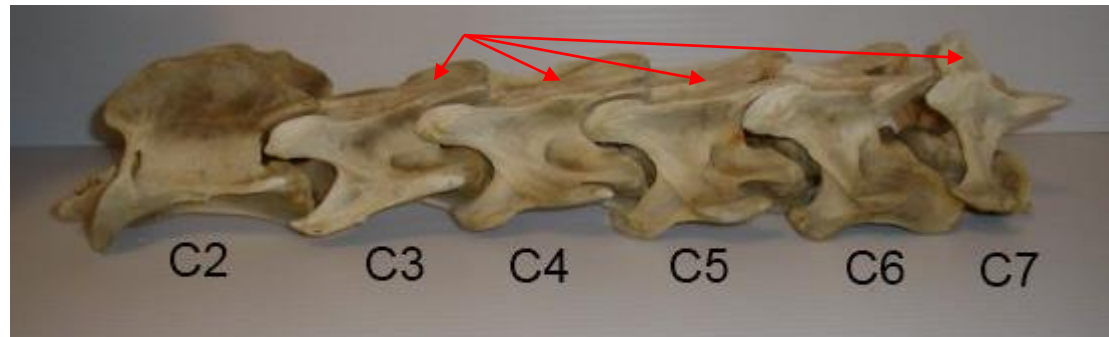
CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

3rd - 7th CERVICAL VERTEBRAE (C3 – C7):

PROCESSUS SPINOSUS:

In Eq:

- rudimentary



<https://www.rodnikkel.com/content/saddle-tree-blog-from-shop-and-desk/the-cervical-neck-vertebrae-and-how-they-move/>

Caudal articular process
Cranial articular process
with the articular surface
Spinous process
Cranial extremity
Cranial articular process
Transverse foramen
Transverse process with
ventral tubercle

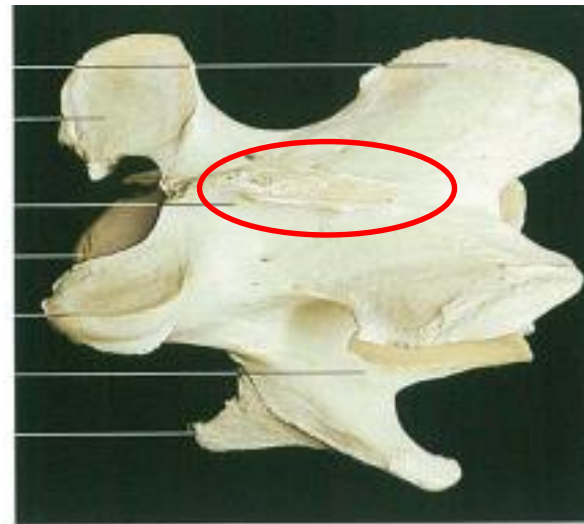


Fig. 1-62. Third cervical vertebra of a horse (dorsolateral aspect).

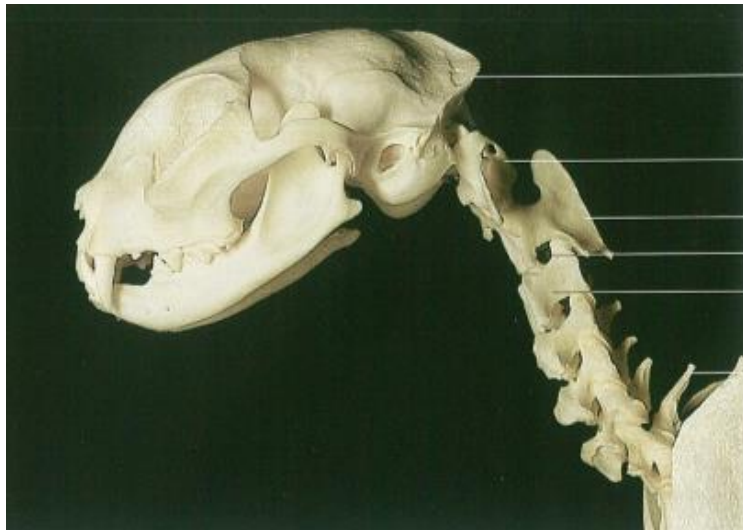
CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

3rd - 7th CERVICAL VERTEBRAE (C3 – C7):

PROCESSUS SPINOSUS:

In the other animals:

- gradually increase in length from cranial to caudal



Protuberantia occipitalis externa

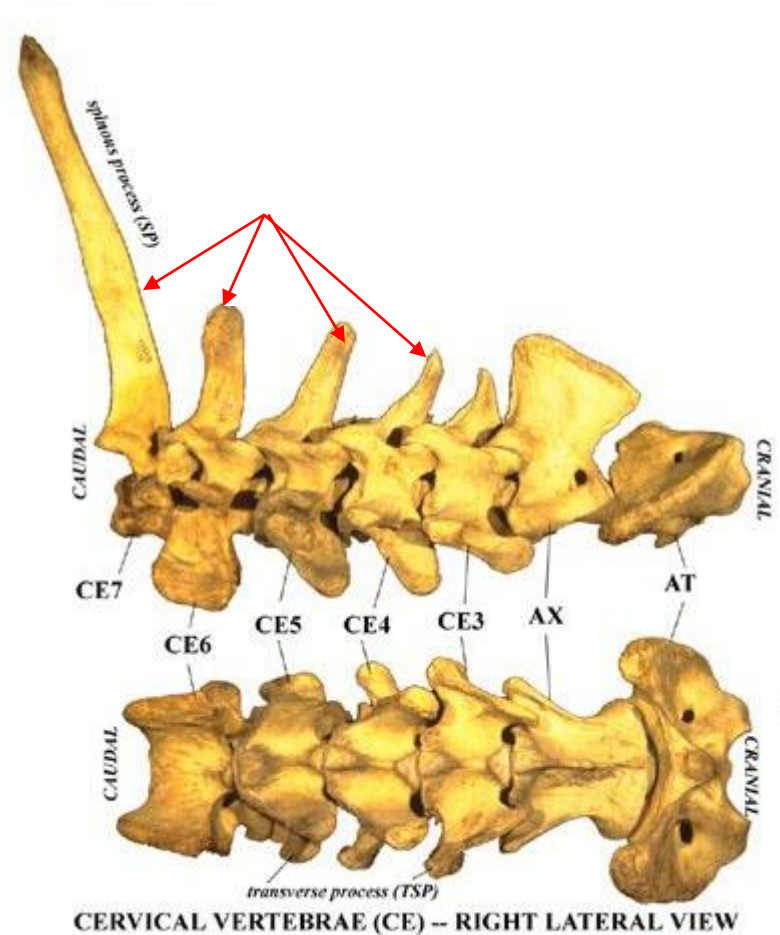
Atlas

Axis, Processus spinosus

Foramen intervertebrale
3. Halswirbel

Processus spinosus
des 7. Halswirbels

Fe, lateral aspect



CERVICAL VERTEBRAE (CE) -- RIGHT LATERAL VIEW

<https://www.pinterest.ph/pin/330522060127487433/>

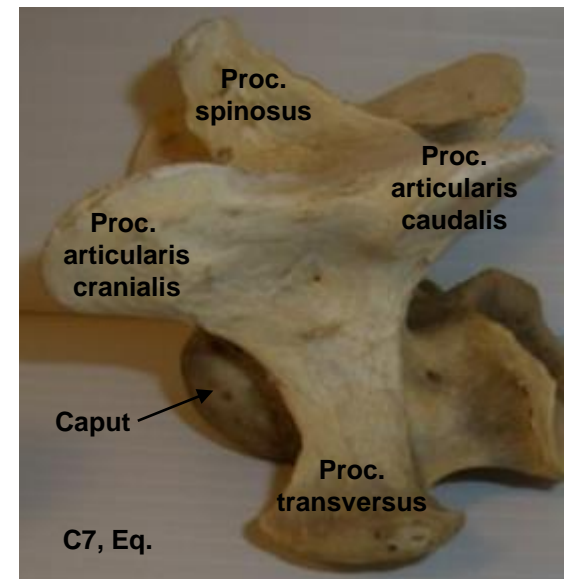
Cervicale vertebrae, Bo.

CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

3rd - 7th CERVICAL VERTEBRAE (C3 – C7):

PROCESSUS TRANSVERSUS:

- distinct
- each comprises a ventral and a dorsal part – except the C7
- perforated at their roots by the transverse foramen
- **transverse process of C7 – has no transverse foramen**



Caudal articular process
Cranial articular process with the articular surface
Spinous process
Cranial extremity
Cranial articular process
Transverse foramen
Transverse process with ventral tubercle

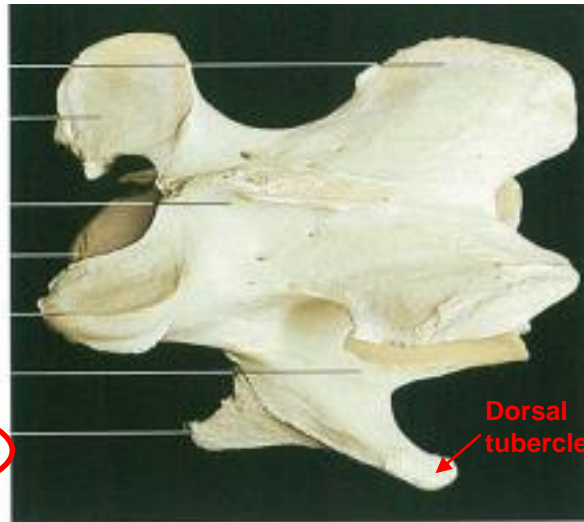
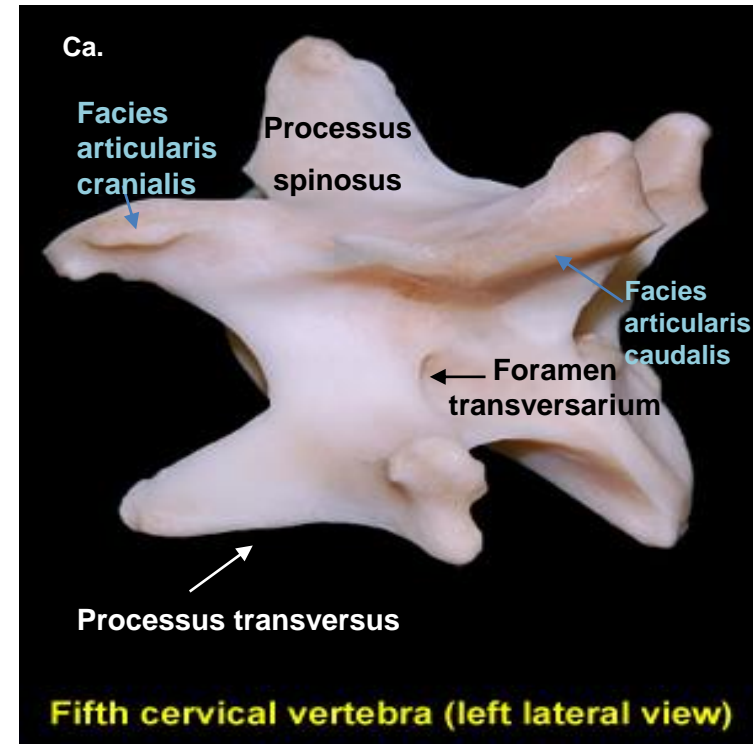


Fig. 1-62. Third cervical vertebra of a horse (dorsolateral aspect).



Fifth cervical vertebra (left lateral view)

CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

PROCESSUS TRANSVERSUS of 6th CERVICAL VERTEBRA:

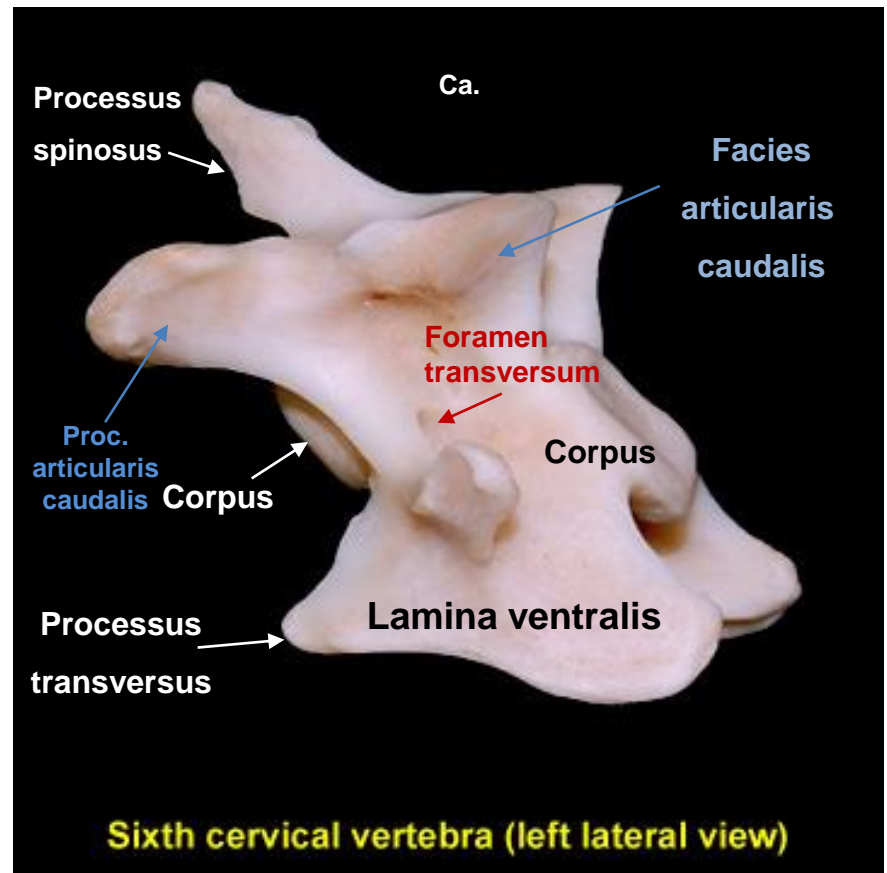
- modified into a plate – like projection – LAMINA VENTRALIS (VENTRAL PLATE)



C6, Su.

Spinous process
Cranial articular process
Vertebral foramen
Transverse process with
its dorsal tubercle
Cranial extremity

Ventral plate

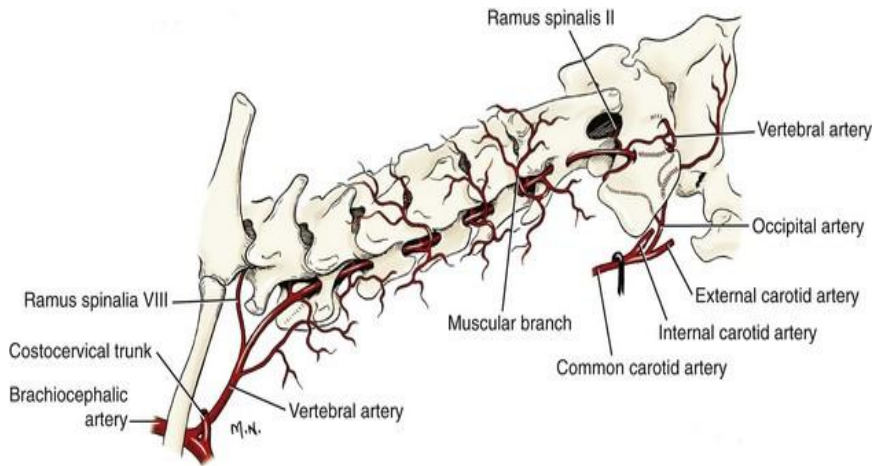


Sixth cervical vertebra (left lateral view)

CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

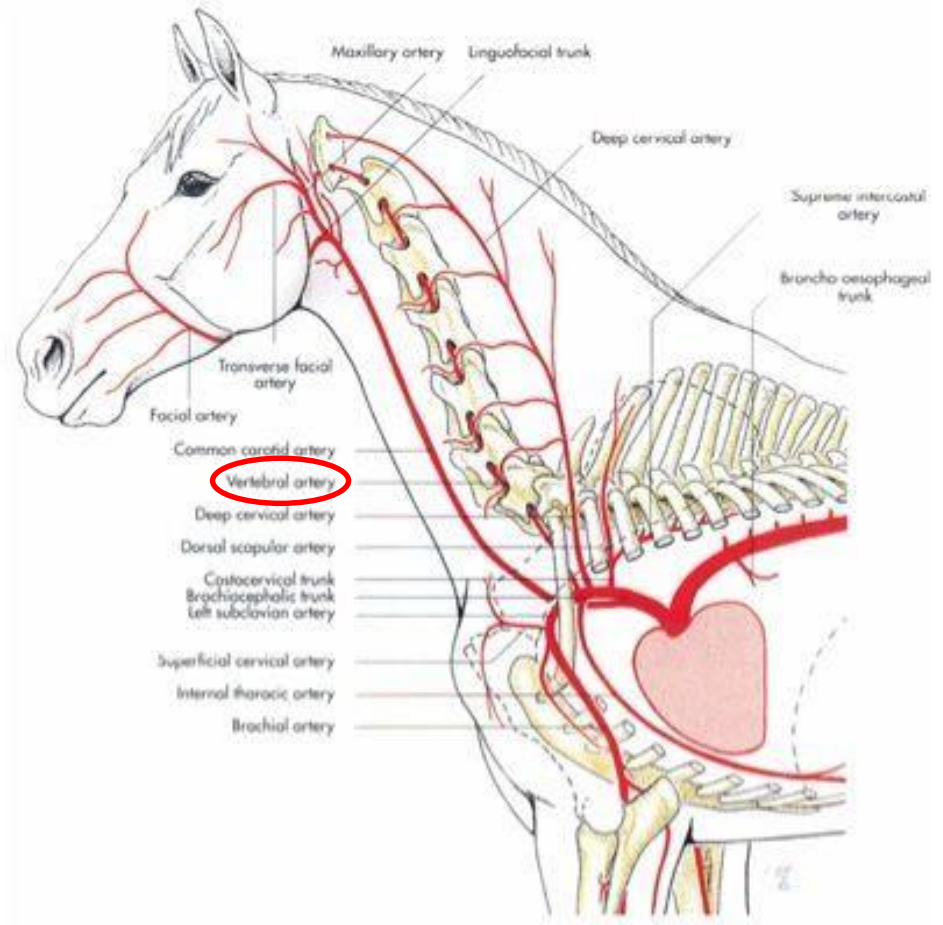
TRANSVERSE FORAMINA:

- of all cervical vertebrae (**except C7**) form the TRANSVERSE CANAL (CANALIS TRANSVERSARIUS)
- the transverse canal houses the vertebral artery (arteria vertebralis)



Ca.

<https://veteriankey.com/cervical-spine/>



CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

3rd - 7th CERVICAL VERTEBRAE (C3 – C7):

PROCESSUS ARTICULARIS CRANIALIS ET CAUDALIS:

- large
- their articular surfaces (Facies articularis cranialis et caudalis) are in horizontal plane – allows free lateral movement of the neck

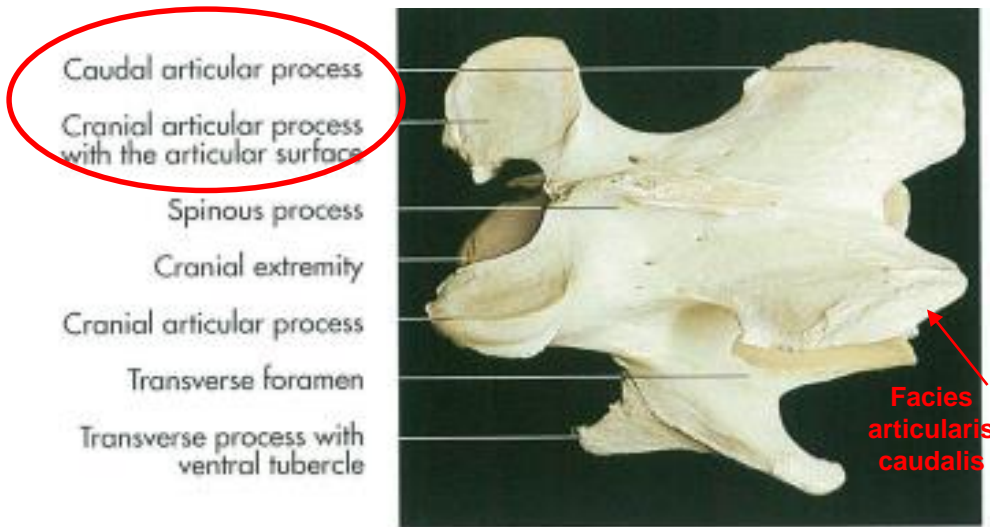
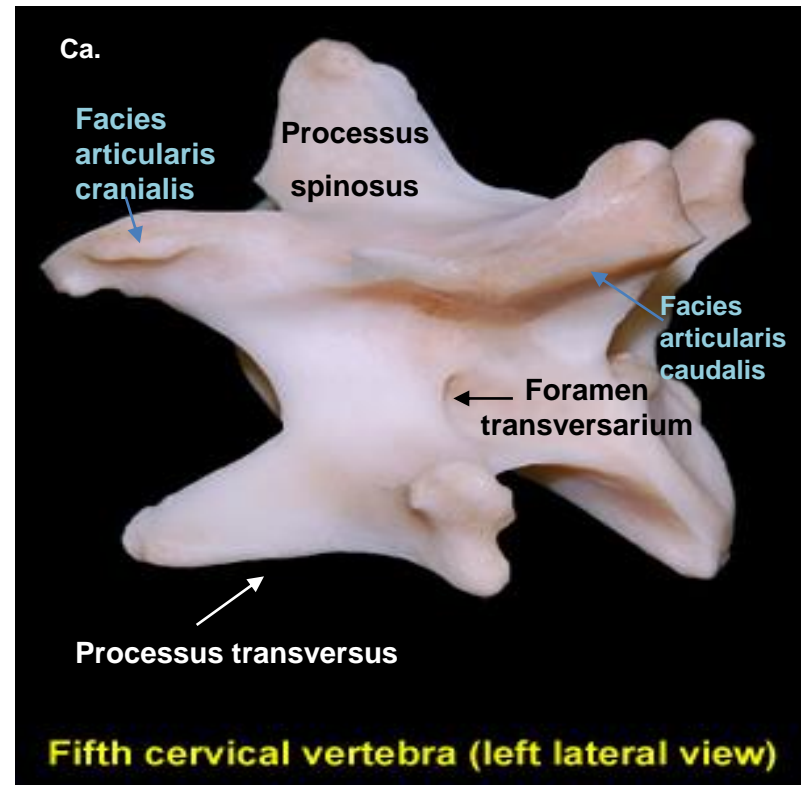


Fig. 1-62. Third cervical vertebra of a horse (dorsolateral aspect).

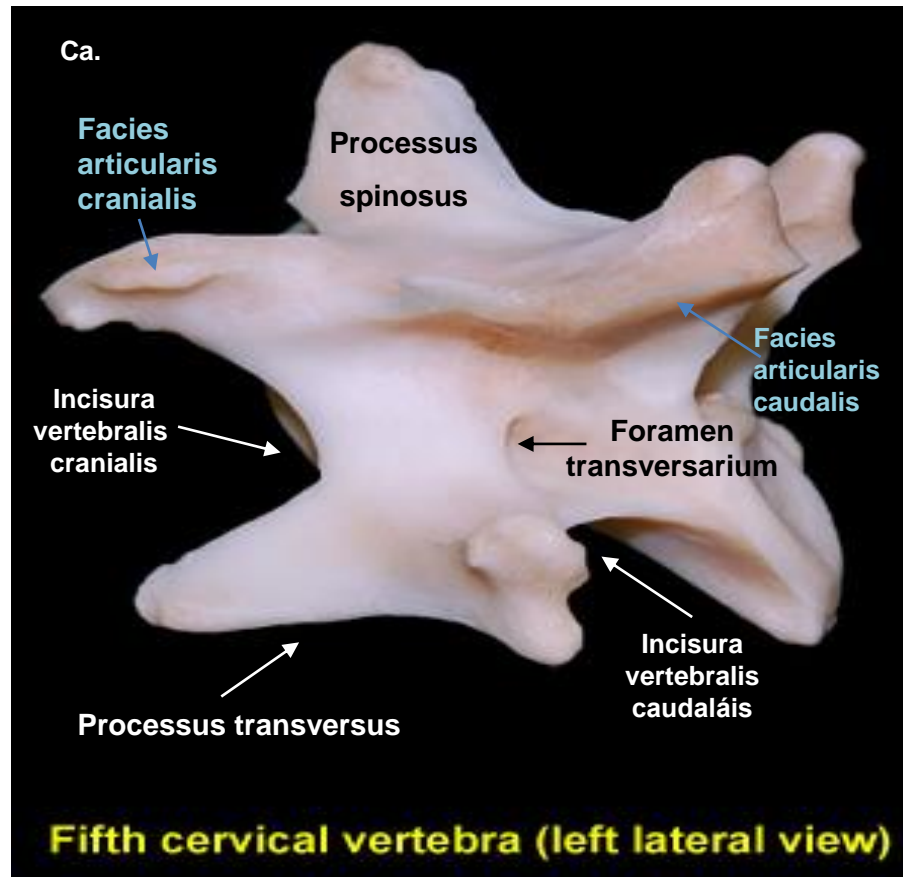


CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

3rd - 7th CERVICAL VERTEBRAE (C3 – C7):

INCISURA VERTEBRALIS CRANIALIS ET CAUDALIS:

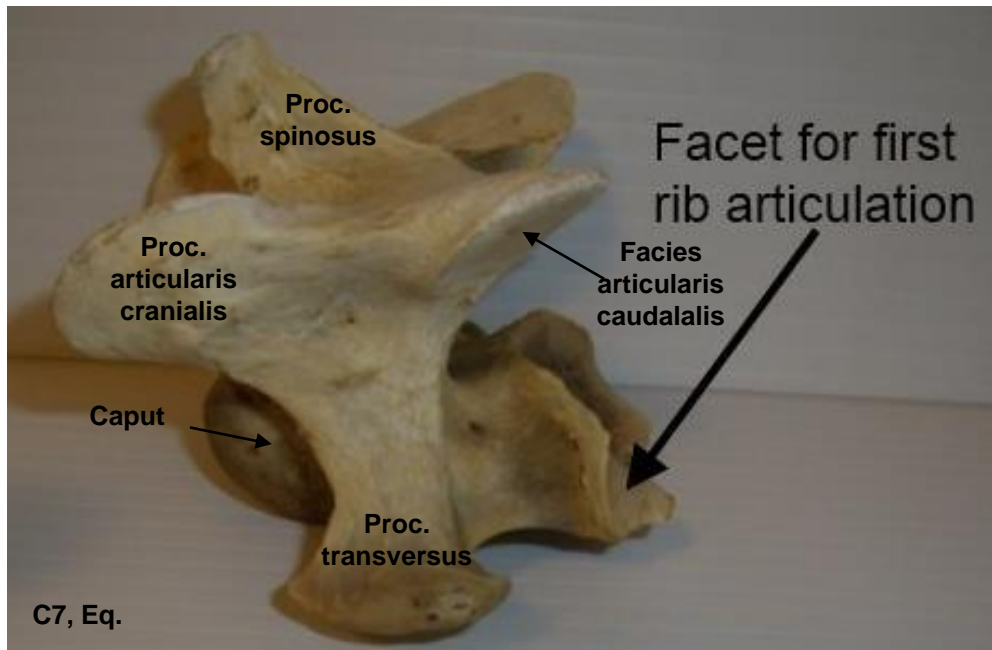
- deep



CERVICAL VERTEBRAE (VERTEBRAE CERVICALES)

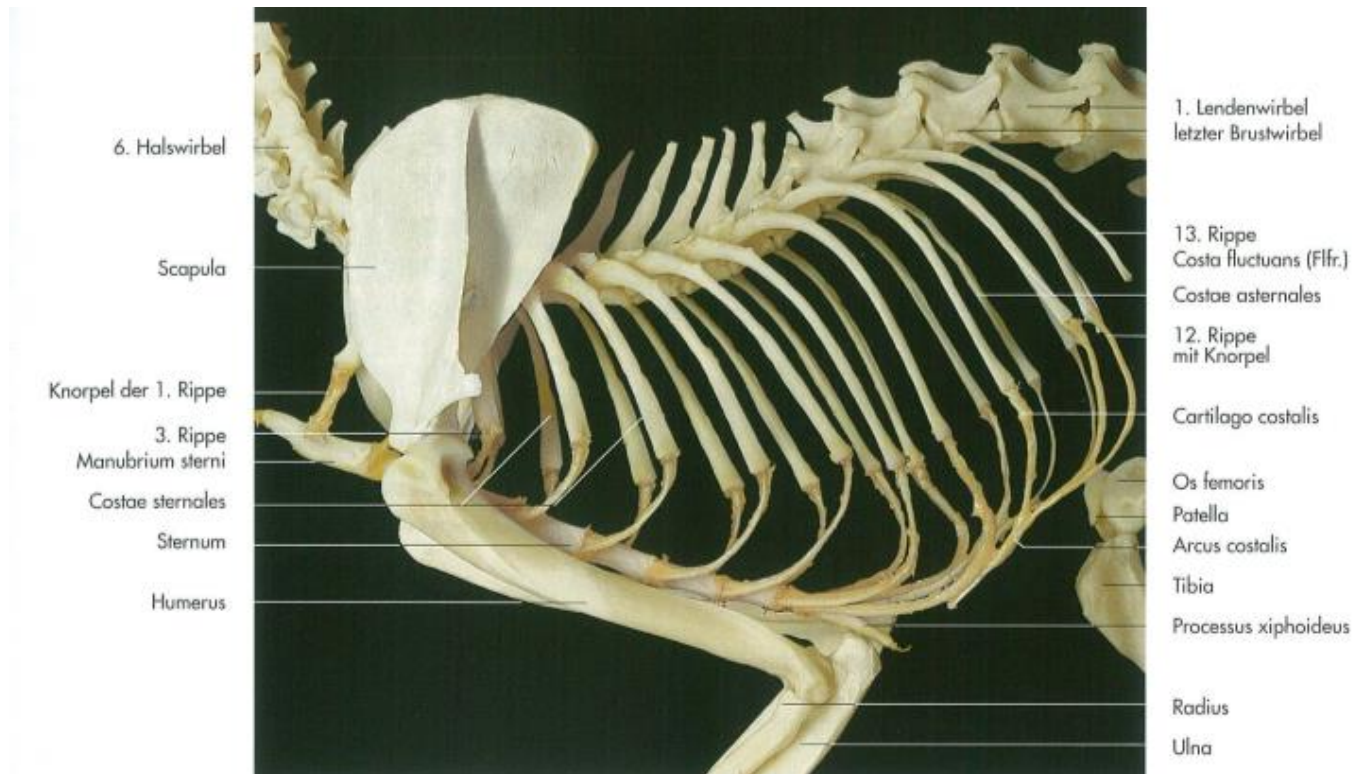
7th CERVICAL VERTEBRAE (C7):

1. the body is short
2. caudodorsally has a **FOVEA COSTALIS CAUDALIS** – articular surface for the head of the 1st rib with the cranial fovea of the 1st thoracic vertebra
3. spinous process is high
4. transverse process represented by their dorsal parts and dorsal tuberosities
5. the transverse foramen is absent



THORACIC VERTEBRAE (VERTEBRAE THORACICAE)

- a) the thoracic vertebrae
- b) the paired ribs
- c) the sternum form the bony boundaries of the thoracic cavity

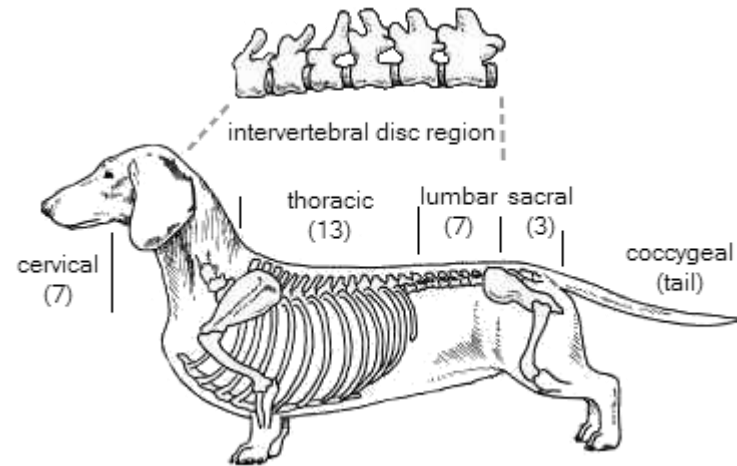


Skeleton of the thorax, Fe, lateral aspect

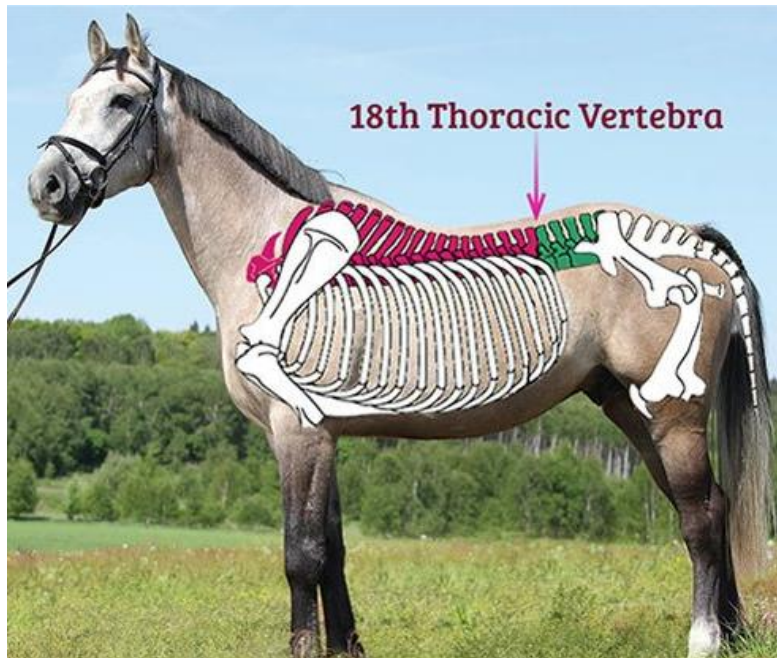
THORACIC VERTEBRAE (VERTEBRAE THORACICAE)

THE NUMBER OF THE THORACIC VERTEBRAE:

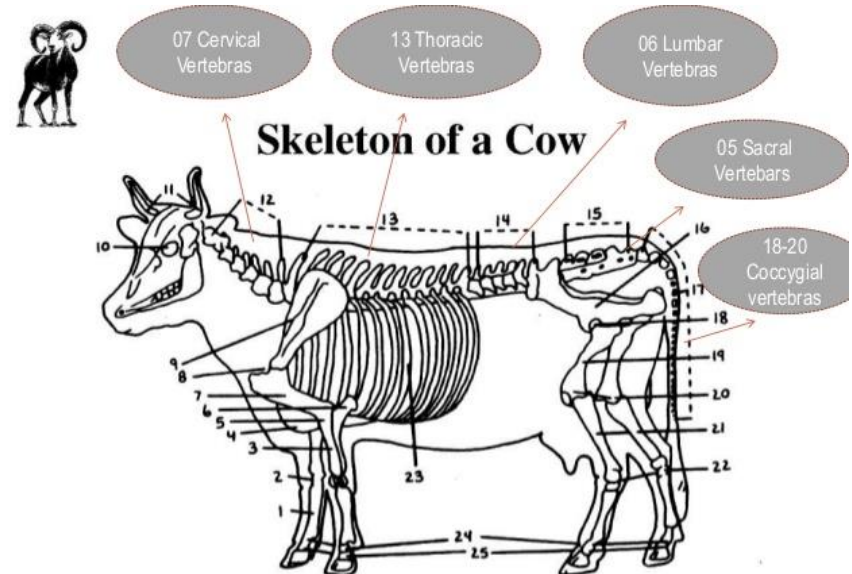
1. in Ca, Bo – 13
2. in Pigs – 14 or 15
3. in Eq 18



https://www.australiandoglover.com/2018/06/intervertebral-disc-disease-ivdd-in-dogs_29.html



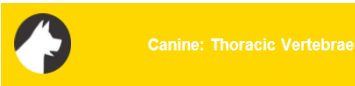
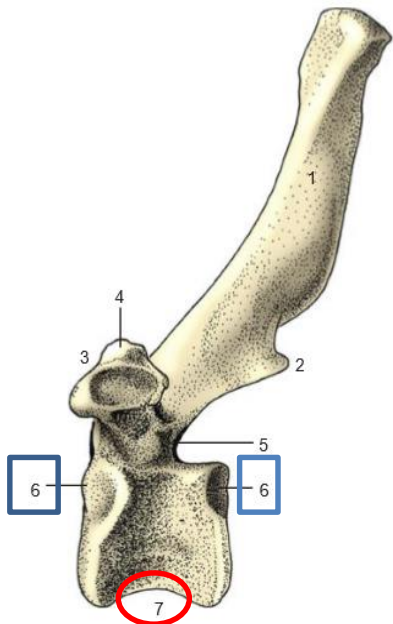
<https://www.horsetalk.co.nz/2016/03/21/saddle-horse-pain-equine-symptomatic-lameness/>



THORACIC VERTEBRAE (VERTEBRAE THORACICAE)

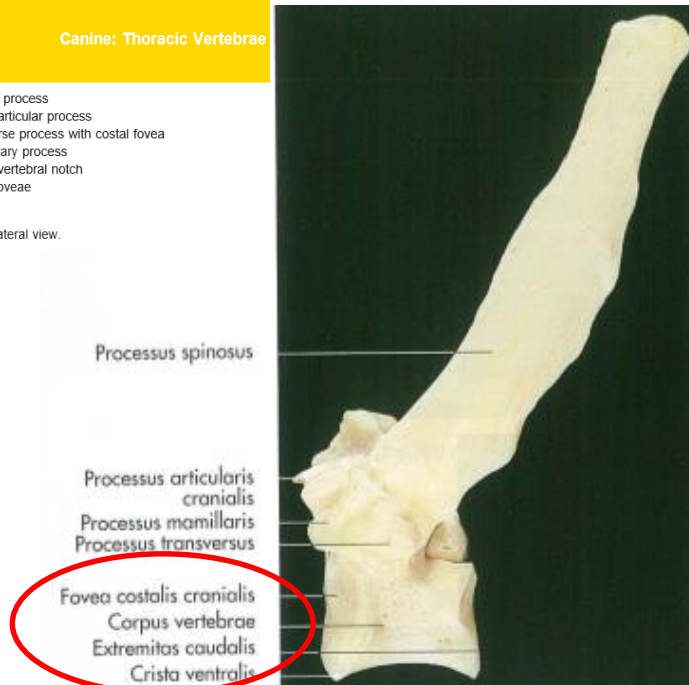
THE BODY (Corpus vertebrae):

- shorter
- caudal thoracic vertebrae present small ventral crest
- **FOVEA COSTALIS CRANIALIS ET CAUDALIS – articulate with the heads of the ribs**
- **the last thoracic vertebra has no Fovea costalis caudalis**

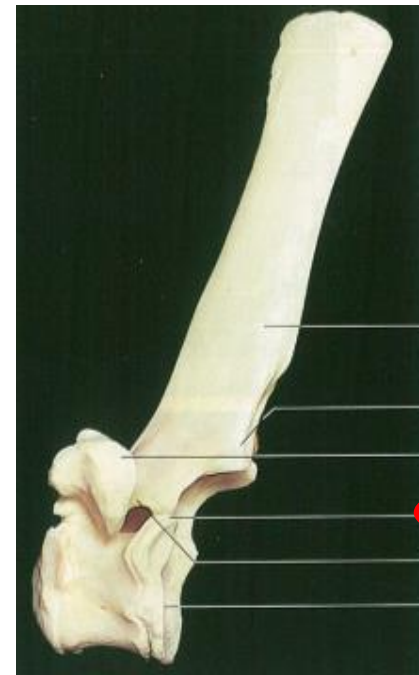


1. Spinous process
2. Caudal articular process
3. Transverse process with costal fovea
4. Mammillary process
5. Caudal vertebral notch
6. Costal foveae
7. Body

Note: Left, lateral view.



Th vertebra, Su., left lateral aspect

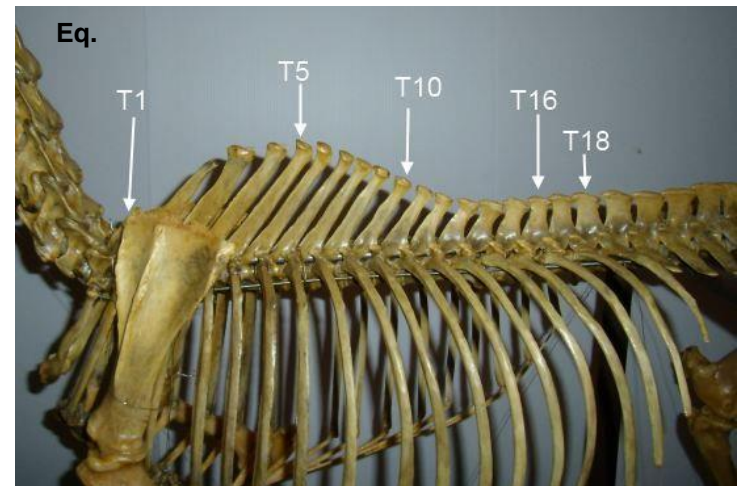


Th vertebra, Bo., lateral aspect

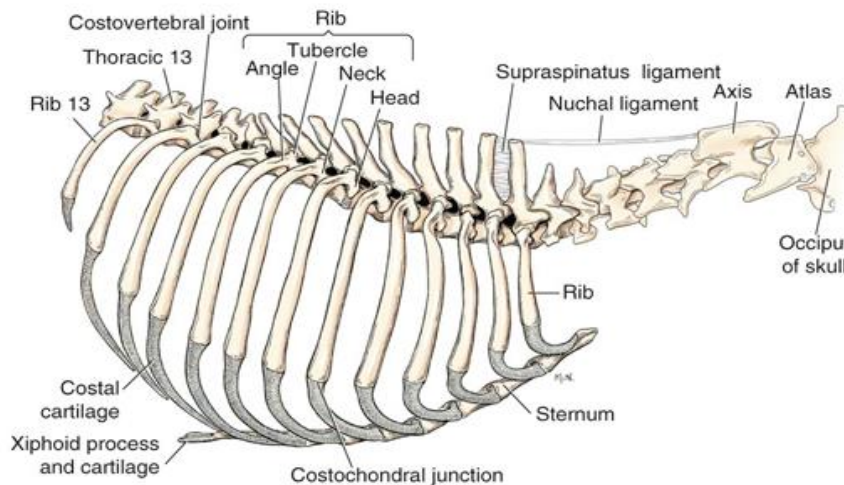
THORACIC VERTEBRAE (VERTEBRAE THORACICAE)

PROCESSUS SPINOSUS:

1. of the more cranial thoracic vertebrae are well developed
- ❖ In Car – gradually reduced in size
 - ❖ In Bo – increases in length to the 3rd vertebra
 - ❖ In Eq – increases in length to the 4th or 5th vertebra
- thereafter they gradually diminish in Bo and Eq to the 12th or 13rd thoracic vertebrae

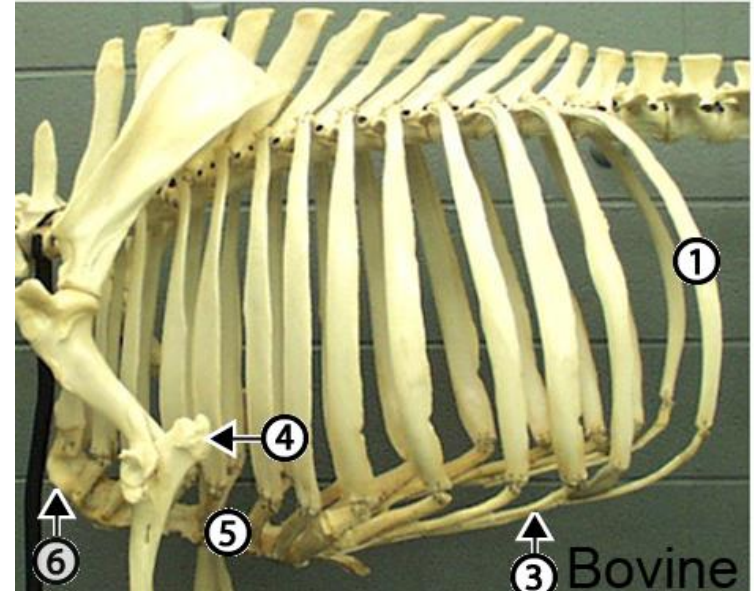


<https://hu.pinterest.com/pin/334603447291668587/>



Ca.

<https://veteriankey.com/canine-anatomy/>



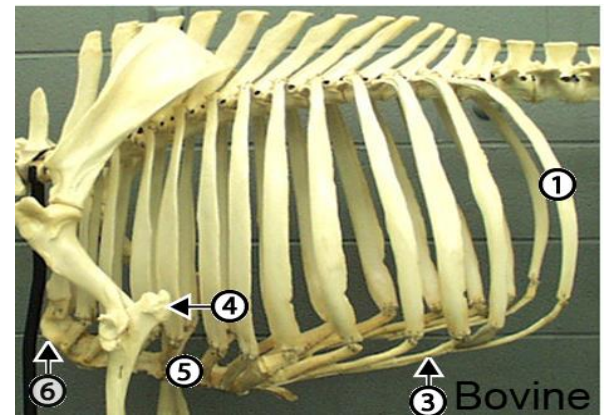
<http://vanat.cvm.umn.edu/ungDissect/Lab09/Img9-1.html>

THORACIC VERTEBRAE (VERTEBRAE THORACICAE)

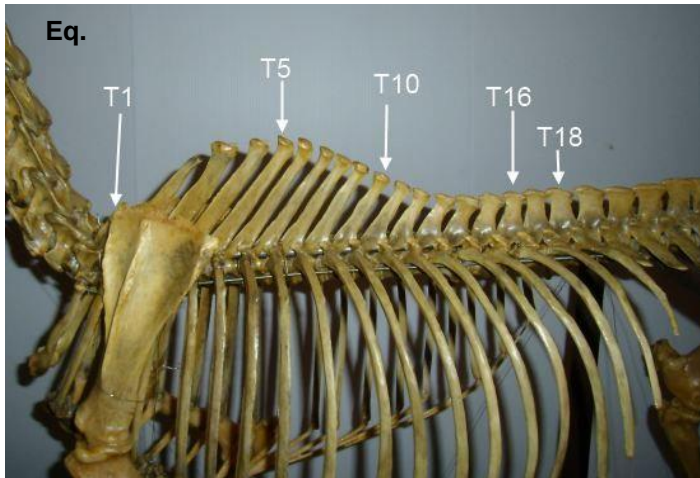
PROCESSUS SPINOSUS:

WITHERS:

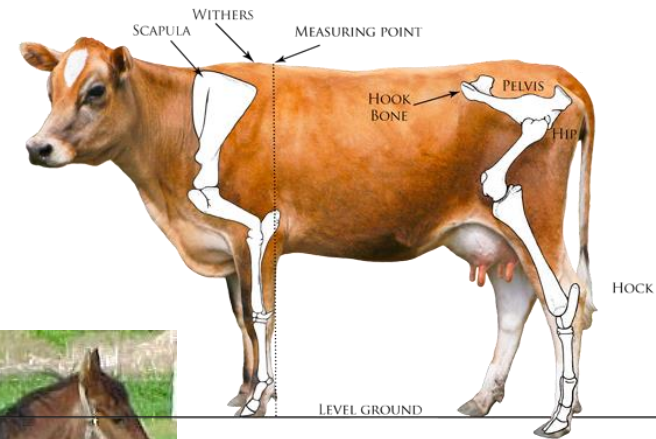
- the region in which the thoracic vertebrae have especially tall spines



<http://vanat.cvm.umn.edu/unqDissect/Lab09/Img9-1.html>



<https://hu.pinterest.com/pin/334603447291668587/>



<https://heritagejersey.org/measuring.aspx>



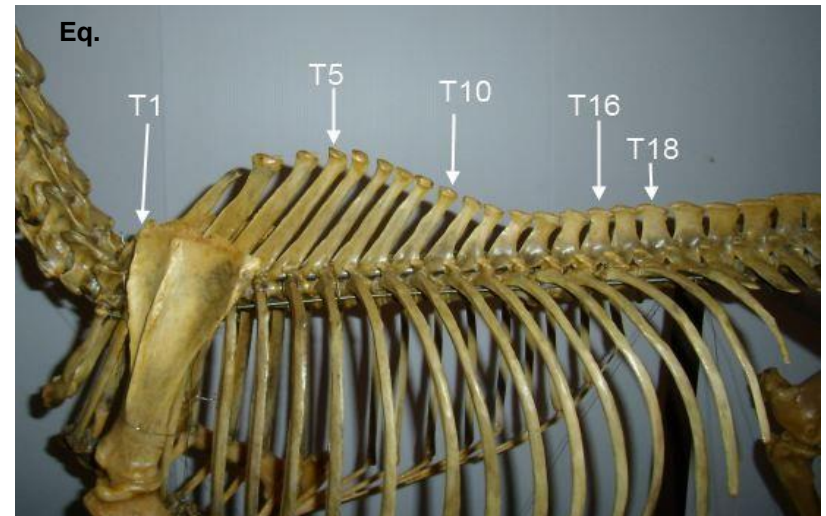
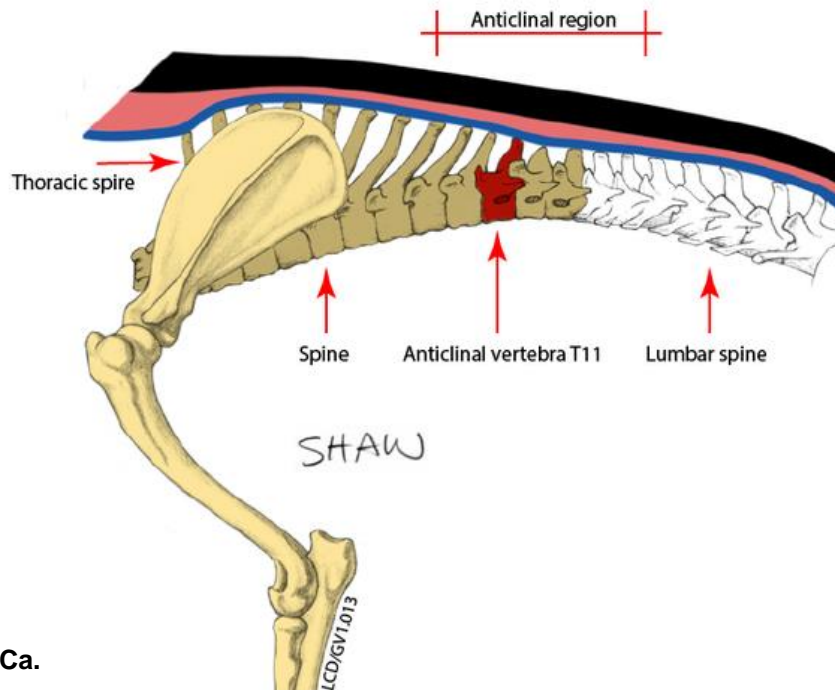
http://www.mitbbs.com/mwap/forum/article.php?board=LeisureTime&groupid=1926053&content_type=all

THORACIC VERTEBRAE (VERTEBRAE THORACICAE)

PROCESSUS SPINOSUS:

VERTEBRA ANTICLINALES:

- the cranial spinous processes are inclined caudally - they gradually become more upright until those of the last thoracic vertebrae like those of the lumbar region – they almost vertical
- thoracic vertebrae with vertical spines are termed VERETBRAE ANTICLINALES
- Vertebrae anticlinales include the last 3 to 4 thoracic vertebra



<https://hu.pinterest.com/pin/334603447291668587/>

Ca.

THORACIC VERTEBRAE (VERTEBRAE THORACICAE)

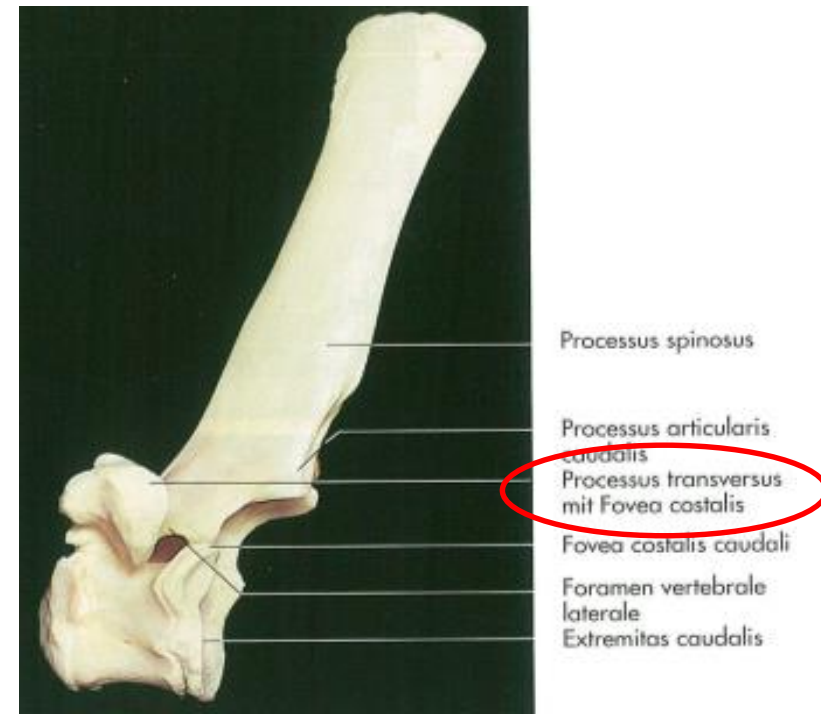
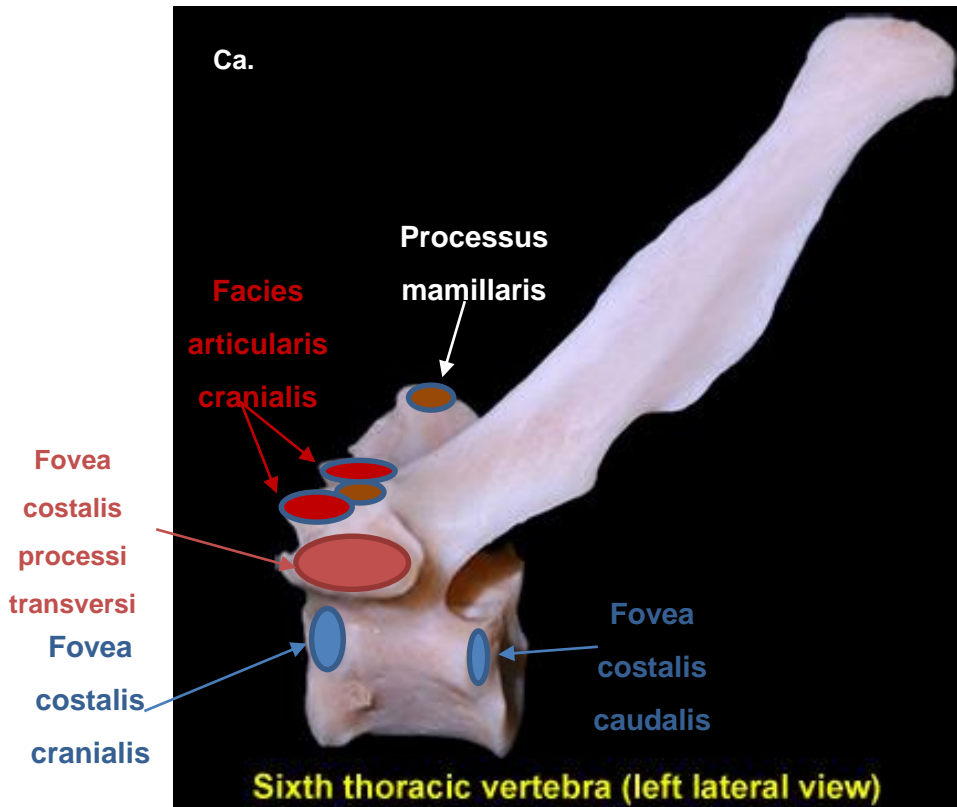
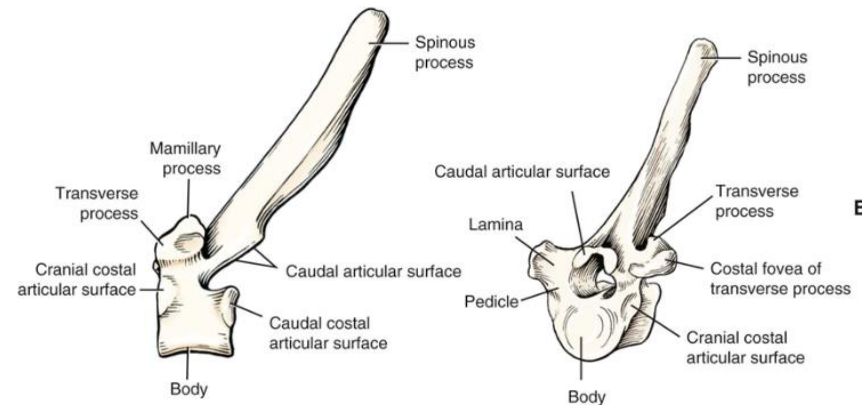
TRANSVERSE PROCESS:

- short

1. FOVEA COSTALIS PROCESSUS TRANSVERSI (TRANSVERSE COSTAL FOVEAE):

<https://veteriankey.com/canine-anatomy/>

- tubercles of the ribs articulate with the transverse costal fovea



Th vertebra, Bo., lateral aspect

THORACIC VERTEBRAE (VERTEBRAE THORACICAE)

CRANIAL AND CAUDAL ARTICULAR PROCESSES:

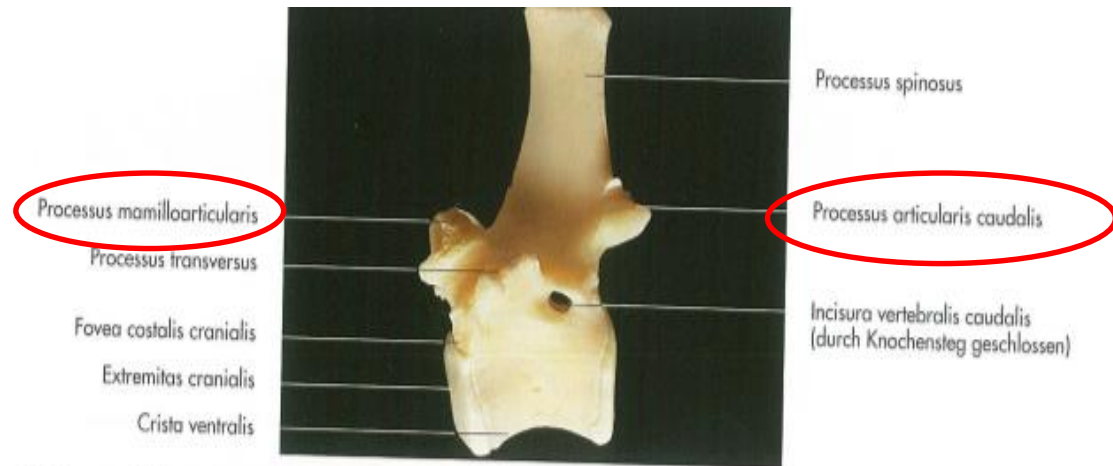
- the cranial articular process fused with the mamillary process

MAMILLARY PROCESSES:

- directed cranially
- the cranial articular process fused with the mamillary process – **PROC. MAMILLOARTICULARES**



Th vertebra, Su., left lateral aspect



Th13, Bo., lateral aspect

THORACIC VERTEBRAE (VERTEBRAE THORACICAE)

ACCESSORY PROCESSES:

- **in Carnivores** - on the last thoracic vertebrae



Th13, Ca., lateral aspect

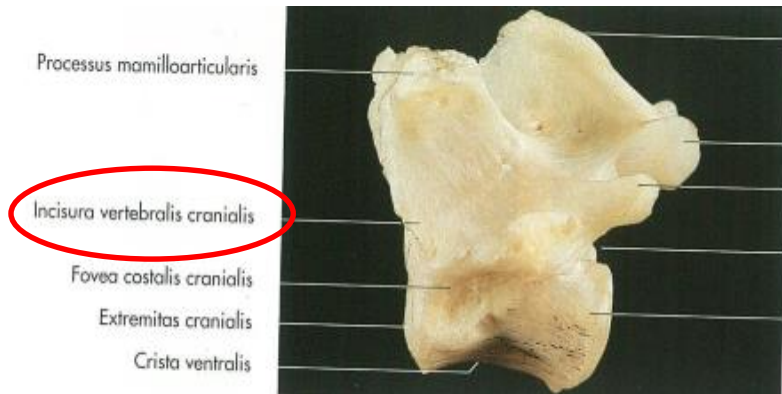
THORACIC VERTEBRAE (VERTEBRAE THORACICAE)

INCISURA VERTEBRALIS CRANIALIS:

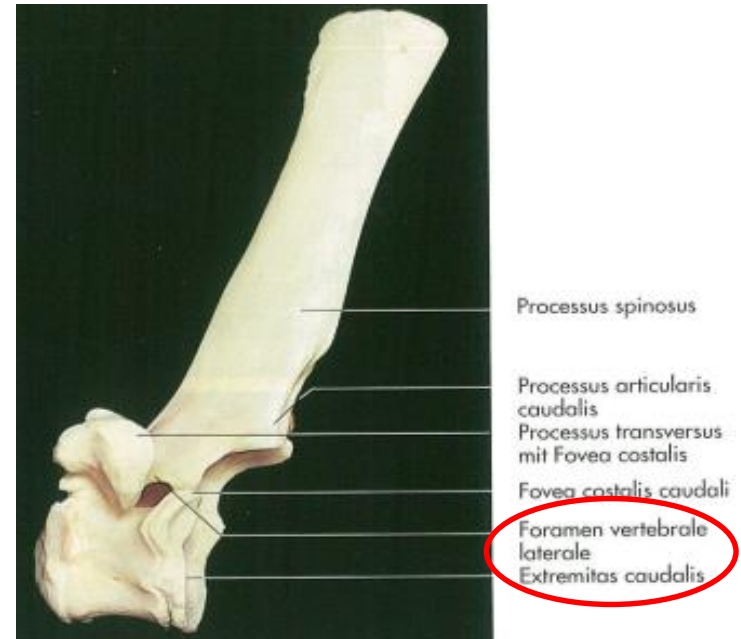
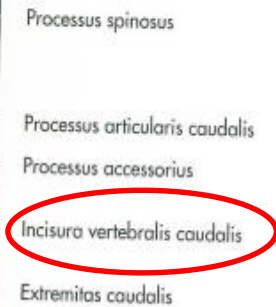
- shallow

INCISURA VERTEBRALIS CAUDALIS:

- deeper
- in ox – a bony ridge divides the lateral vertebral foramen into two



Th13, Ca., lateral aspect

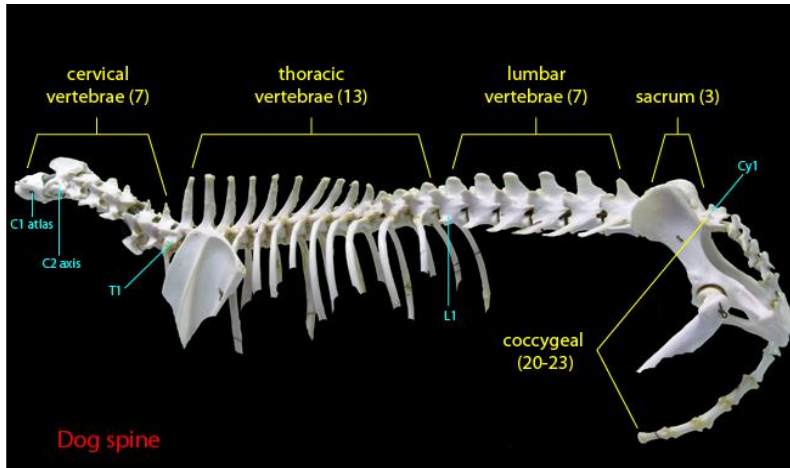


Th vertebra, Bo., lateral aspect

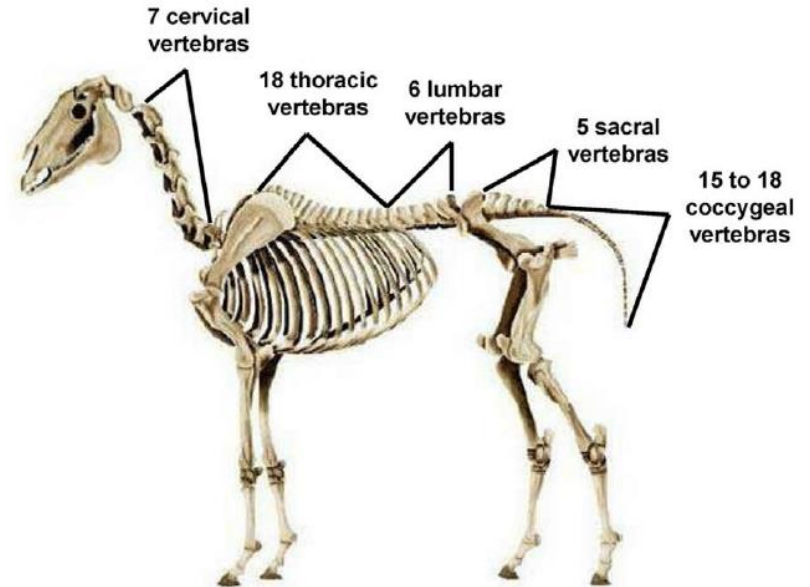
LUMBAR VERTEBRAE (VERTEBRAE LUMBALES)

THE NUMBER OF THE LUMBAR VERTEBRAE:

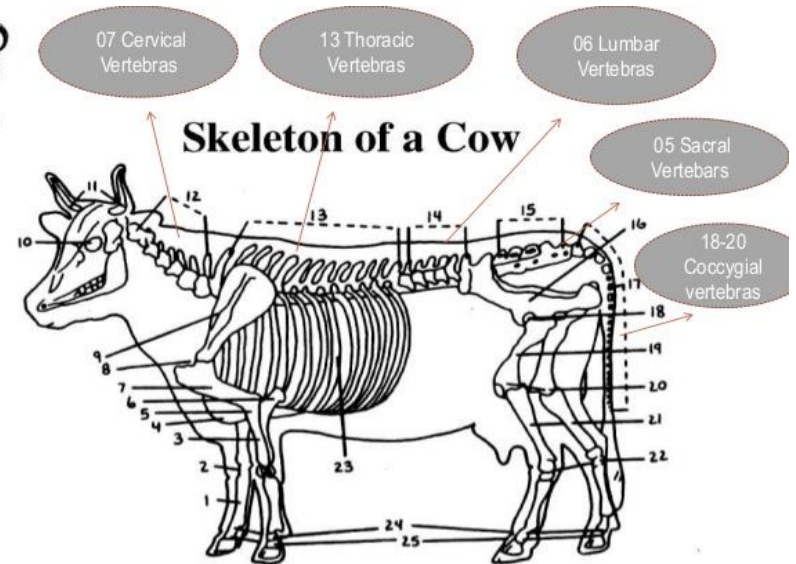
1. in carnivores – 7
2. in pigs , ruminants, horses - 6



<https://hu.pinterest.com/pin/159877855502035893/>



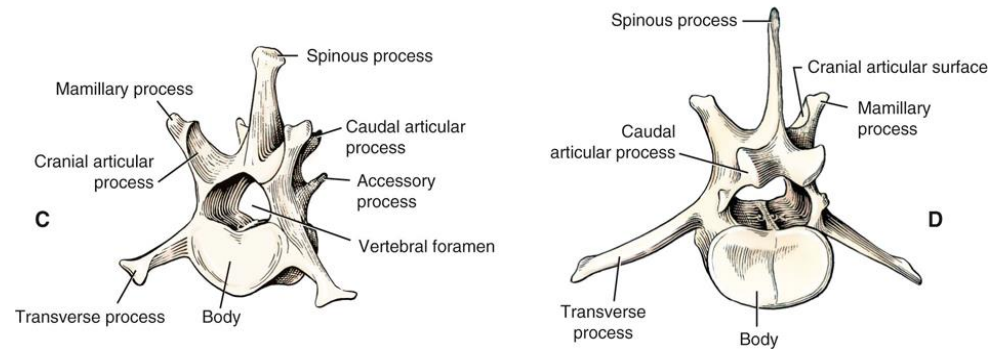
https://www.researchgate.net/figure/The-five-vertebral-areas-cervical-thoracic-lumbar-sacral-and-coccygeal-of-the-horses_fig2_46414425



LUMBAR VERTEBRAE (VERTEBRAE LUMBALES)

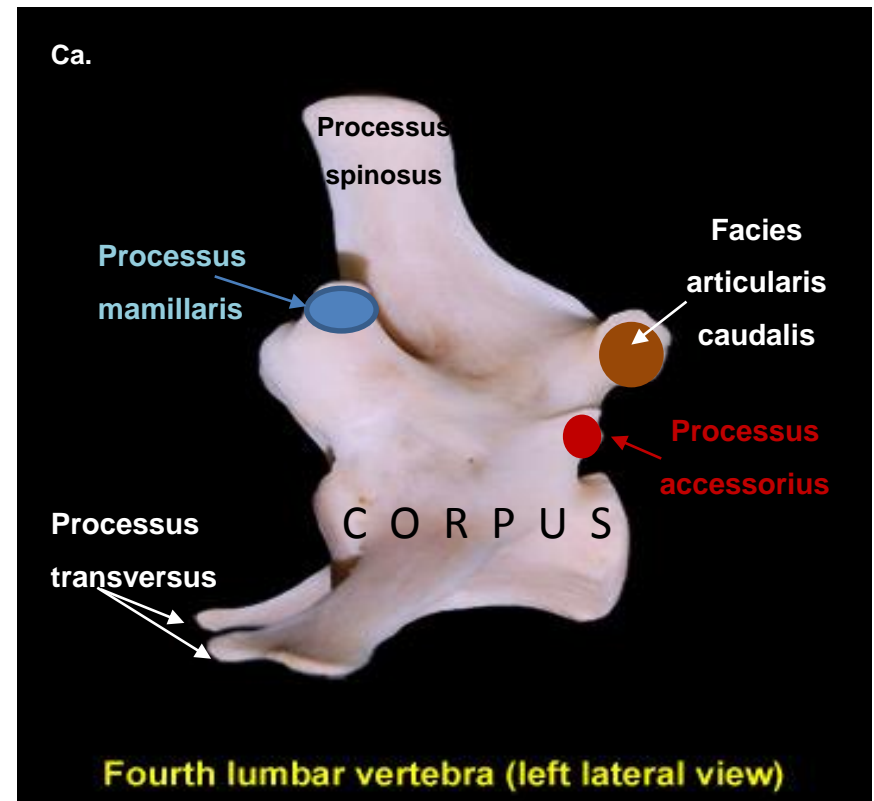
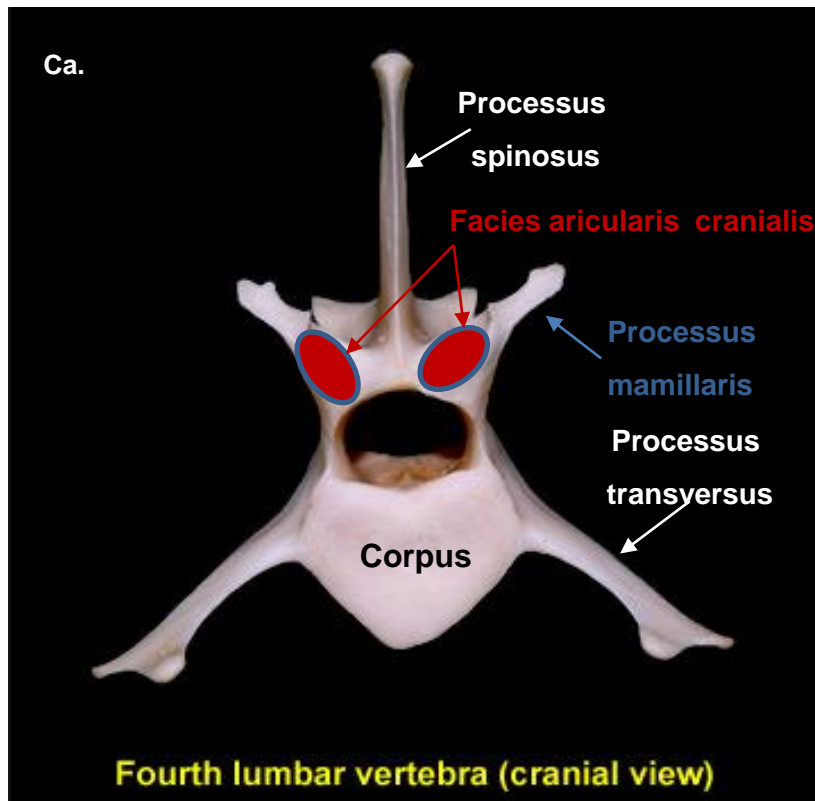
THE VERTEBRAL BODY:

- larger longer
- the cranial and caudal extremities flat
- vertebral arches – well developed



L1 vertebra from a craniolateral view (C), and L5 vertebra from a caudolateral view (D).

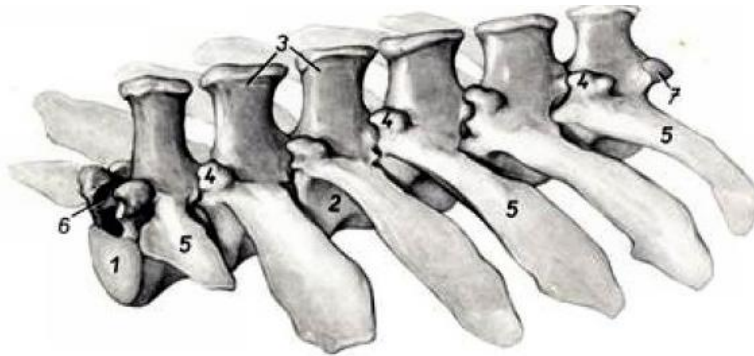
<https://veteriankey.com/canine-anatomy/>



LUMBAR VERTEBRAE (VERTEBRAE LUMBALES)

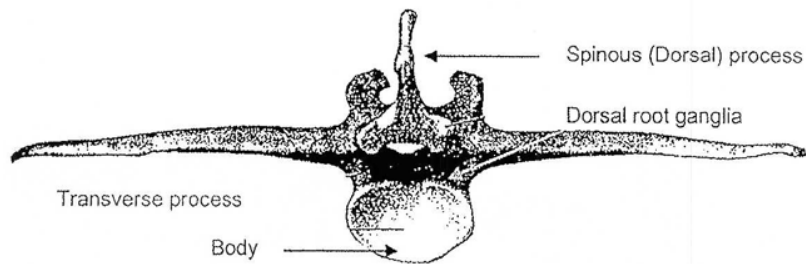
PROCESSUS SPINOSUS:

- in carnivores the length increases in height up to the 5th or 6th vertebrae
- in Eq. long and slender
- in Bo. short



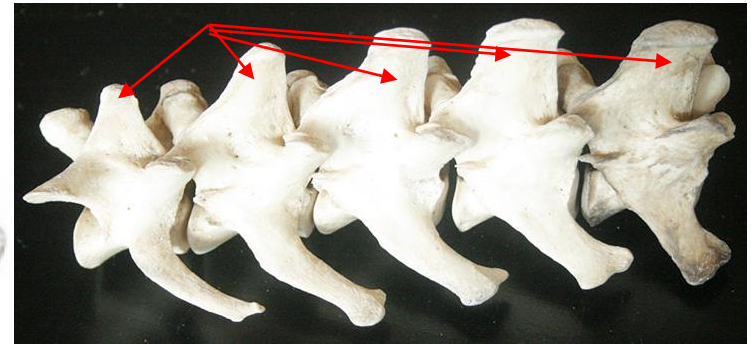
Bo. Skeleton part of lumbar vertebrae,
Dorsolateral view

<https://www.slideshare.net/humanupgrade/skeletal-system-of-bovine>

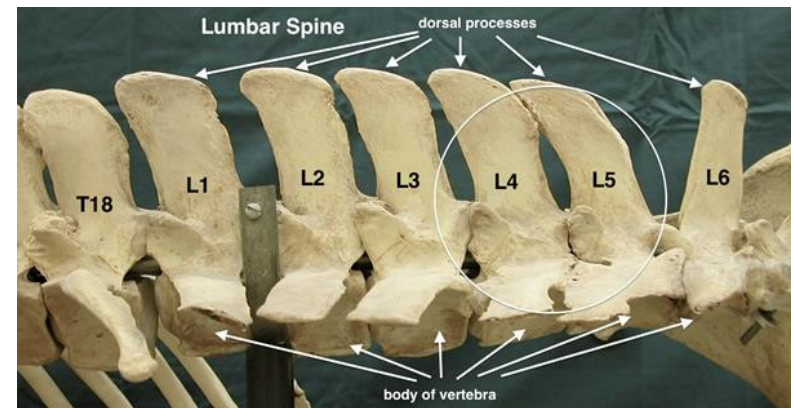


Bovine lumbar vertebra

<https://www.inspection.gc.ca/food/food-specific-requirements-and-guidance/meat-products-and-food-animals/srm/appendix-b/eng/1369853758279/1369853844080>



Lumbar vertebrae, Ca.



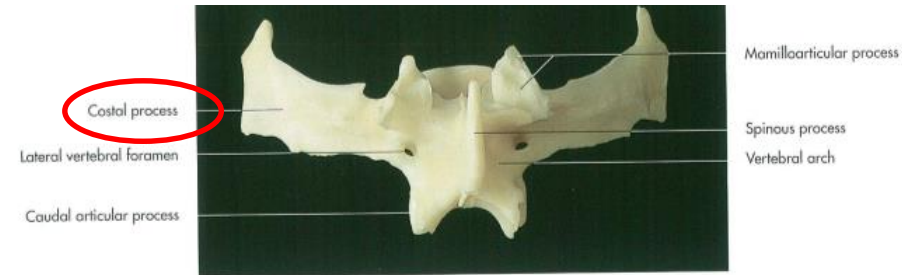
Eg

<https://eclectic-horseman.com/cp10-3b/>

LUMBAR VERTEBRAE (VERTEBRAE LUMBALES)

PROCESSUS TRANSVERSUS (Proc. costalis, costal process):

- represent rudimentary ribs – Proc. costalis
- extend laterally
- in carnivores directed downwards and forwards
- in ruminants directed horizontally, at the end bended, longer than in Eq.
- In horses directed horizontally



1-76. Lumbar vertebra of an ox (dorsal aspect).

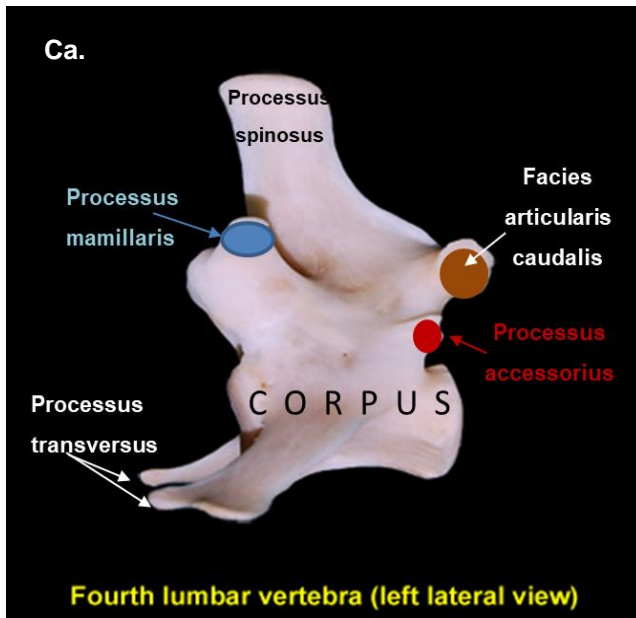


Fig. 1-78. Fifth lumbar vertebra of a horse (dorsal aspect).



Lumbal vertebrae, Ca., dorsal aspect

LUMBAR VERTEBRAE (VERTEBRAE LUMBALES)

PROCESSUS TRANSVERSUS:

In HORSE:

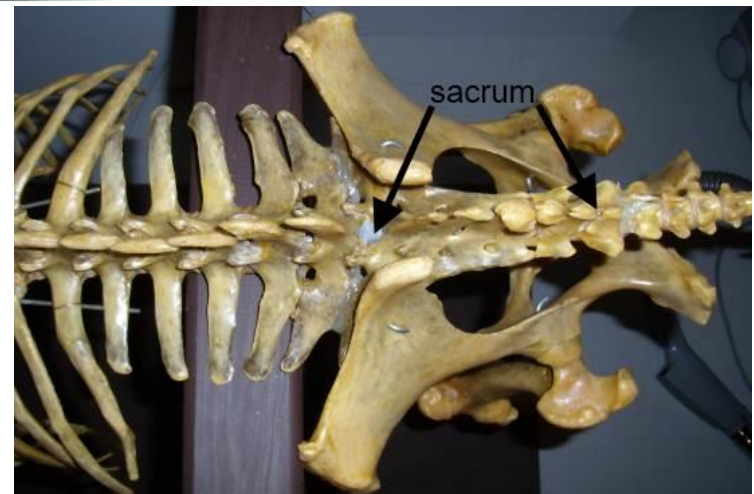
- the transverse processes of the last two vertebrae (L5-L6) articulate with each other – there are articular surfaces on them
- the transverse processes of the last vertebra articulate with the wing of the sacrum



Fig. 1-78. Fifth lumbar vertebra of a horse (dorsal aspect).



<https://www.rodnikkel.com/content/saddle-tree-blog-from-shop-and-desk/the-lumbar-and-sacral-vertebrae/>

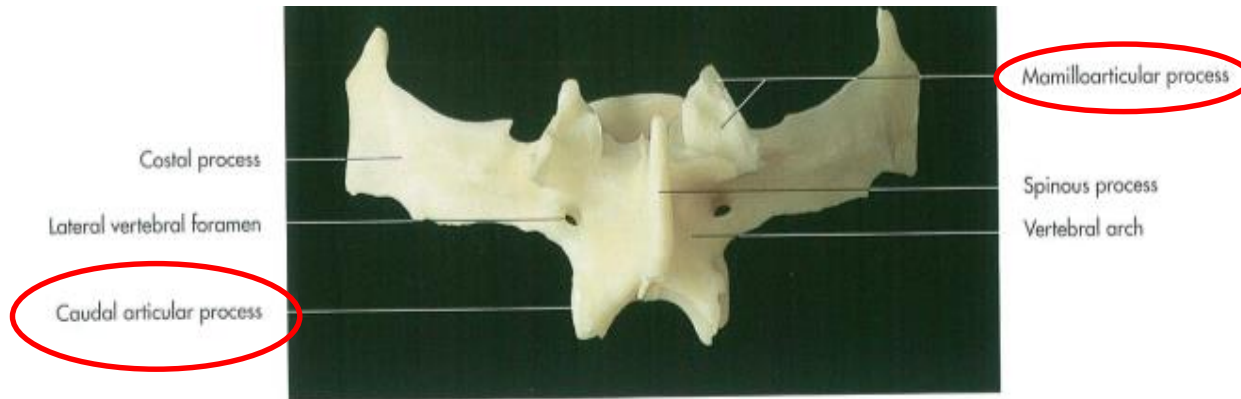


<https://www.rodnikkel.com/content/saddle-tree-blog-from-shop-and-desk/the-major-segments-of-the-equine-spine/>

LUMBAR VERTEBRAE (VERTEBRAE LUMBALES)

PROCESSUS ARTICULARIS:

- the articular surface is sagittal
- the cranial articular process fused with the mamillary processes



1-76. Lumbar vertebra of an ox (dorsal aspect).

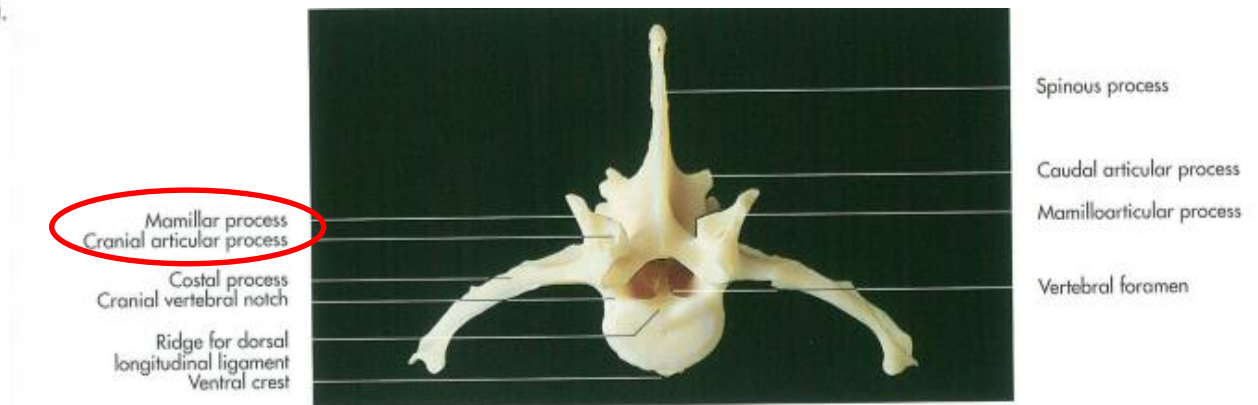
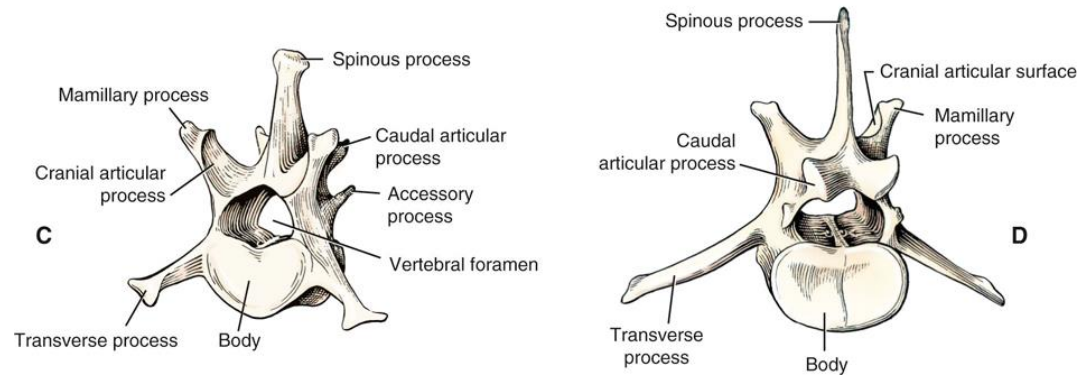


Fig. 1-77. Lumbar vertebra of an ox (cranial aspect).

LUMBAR VERTEBRAE (VERTEBRAE LUMBALES)

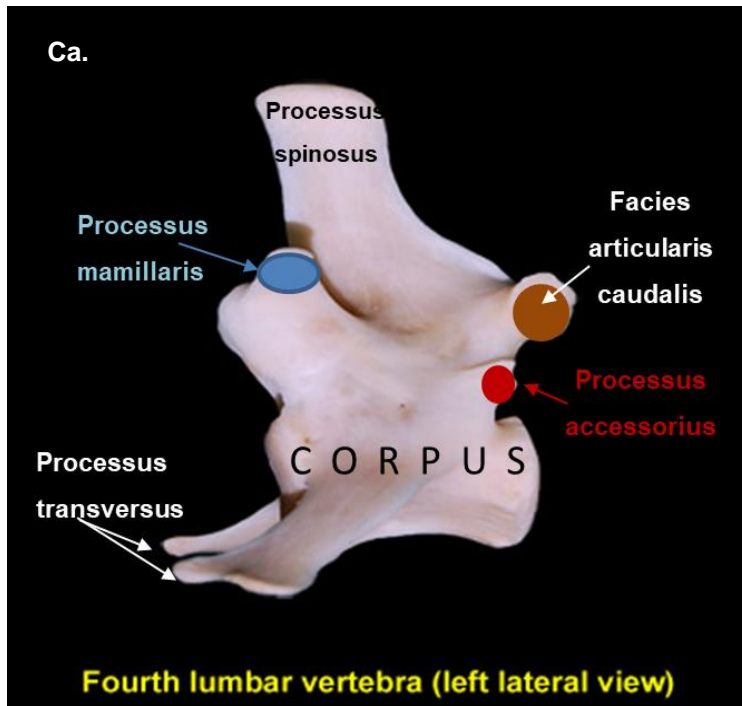
PROCESSUS ACCESSORIUS:

- **only in carnivores**
- **projects caudally**



L1 vertebra from a craniolateral view (C), and L5 vertebra from a caudolateral view (D).

<https://veteriankey.com/canine-anatomy/>



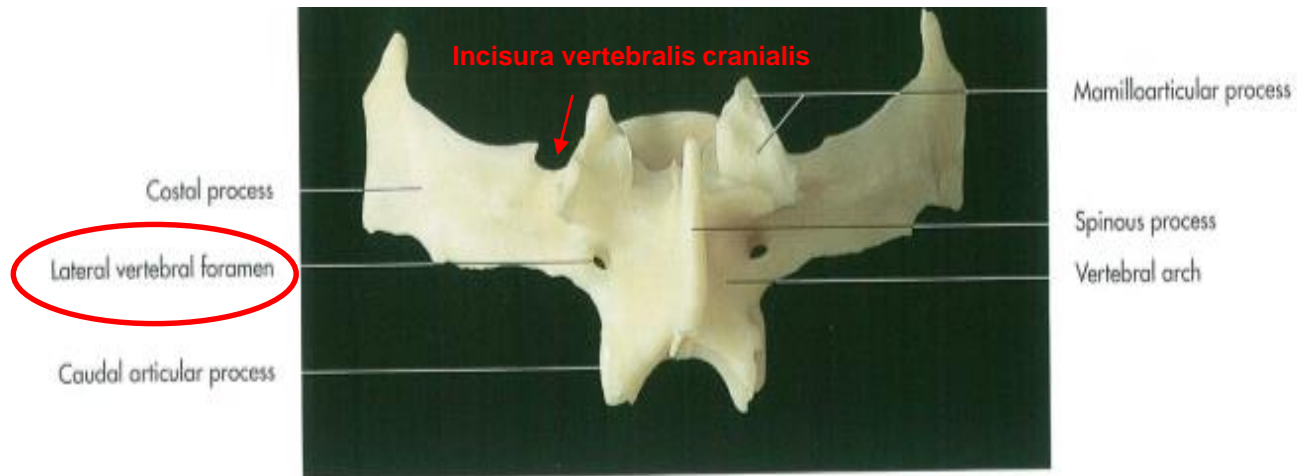
LUMBAR VERTEBRAE (VERTEBRAE LUMBALES)

INCISURA VERTEBRALIS CRANIALIS:

- less deep

INCISURA VERTEBRALIS CAUDALIS:

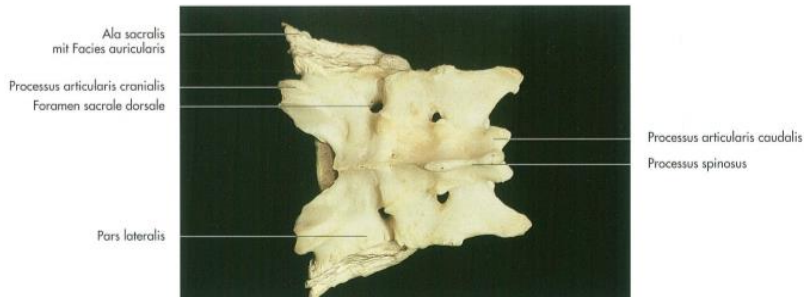
- **In ox** the in the first 3 lumbar vertebrae converted into foramen by a ridge of bone – the lateral vertebral foramen divided



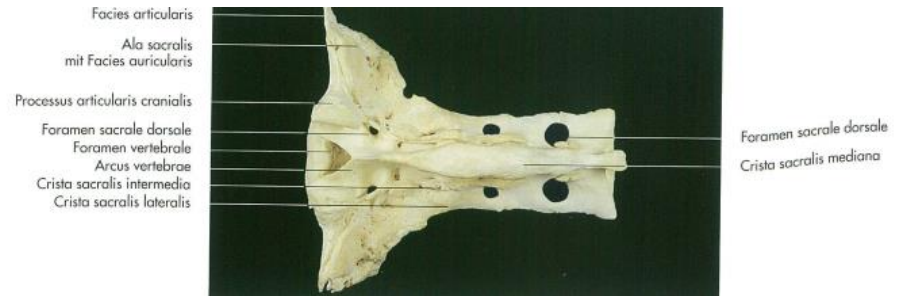
1-76. Lumbar vertebra of an ox (dorsal aspect).

SACRAL VERTEBRAE (VERTEBRAE SACRALES)

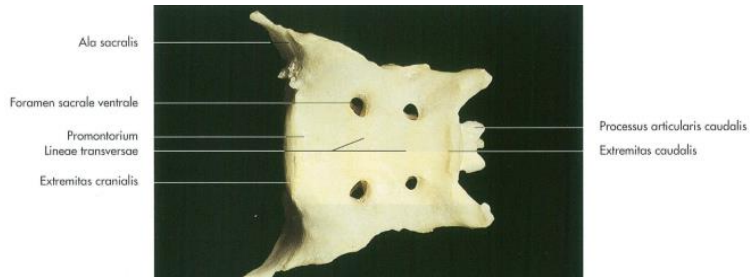
- the sacral region is completely immobile
- OS SACRUM (SACRUM, SACRAL BONE) formed by the fusion of the sacral vertebrae



Sacrum, Ca., dorsal aspect



Sarum, Bo., dorsal aspect



Sacrum, Ca., ventral aspect

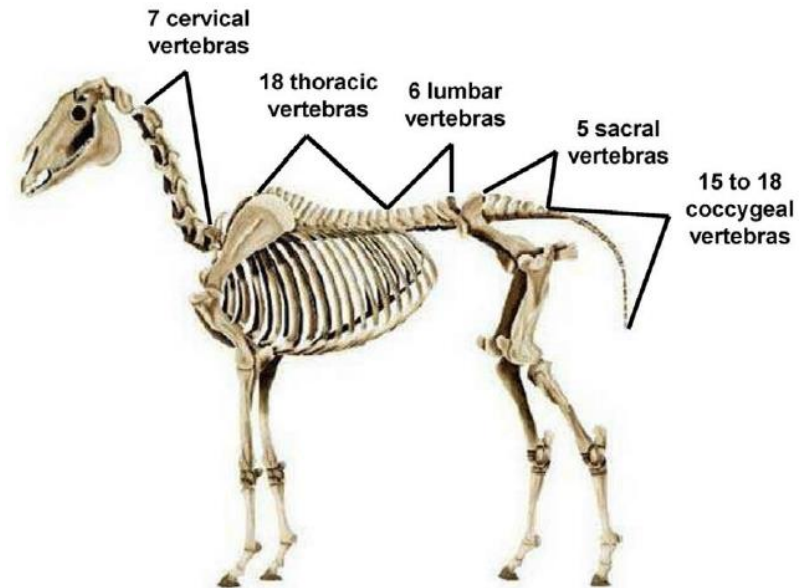


Sacrum, Bo., lateral aspect

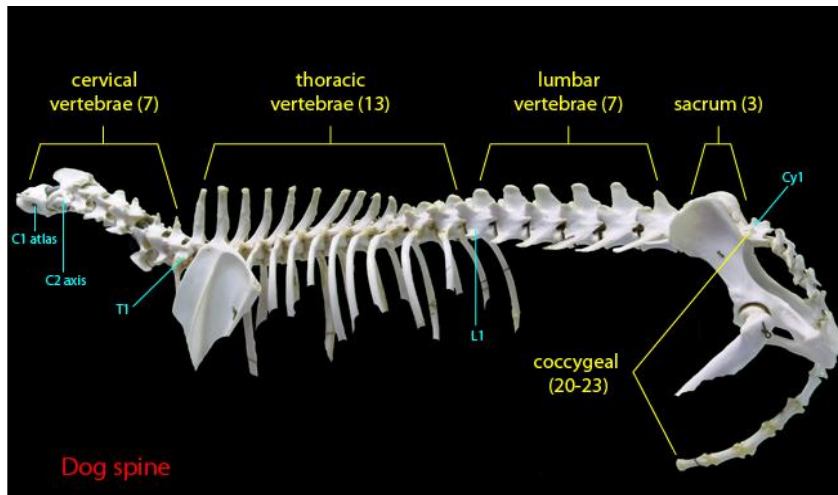
SACRAL VERTEBRAE (VERTEBRAE SACRALES)

THE NUMBER OF THE SACRAL VERTEBRAE:

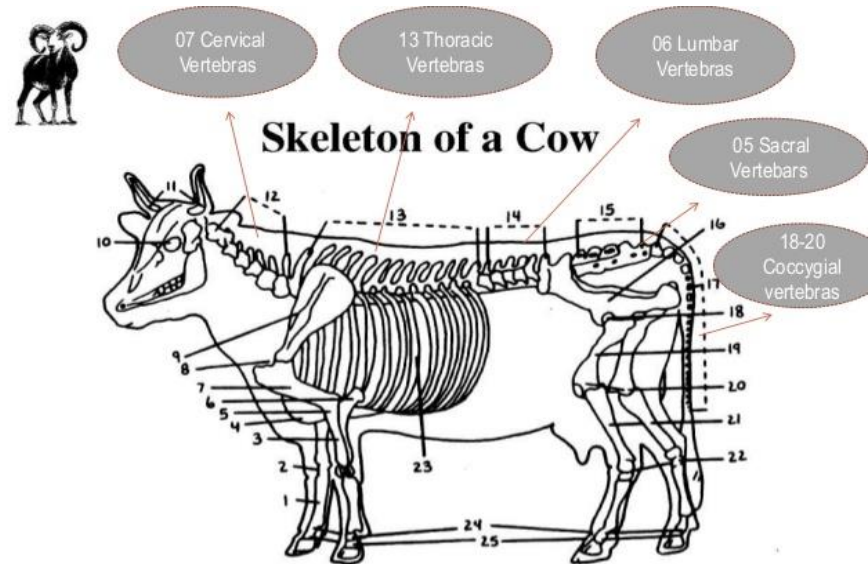
1. in carnivores – 3
2. in pigs – 4
3. in goat, ox, horse - 5
4. in sheep - 4



https://www.researchgate.net/figure/The-five-vertebral-areas-cervical-thoracic-lumbar-sacral-and-coccygeal-of-the-horses_fig2_46414425



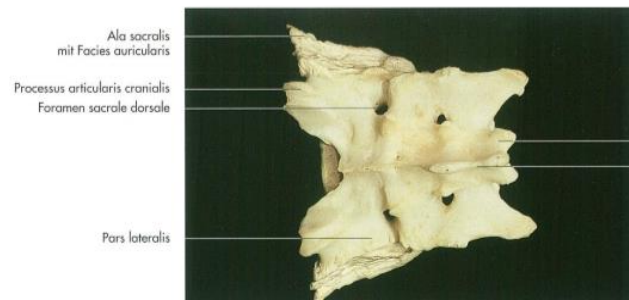
<https://hu.pinterest.com/pin/159877855502035893/>



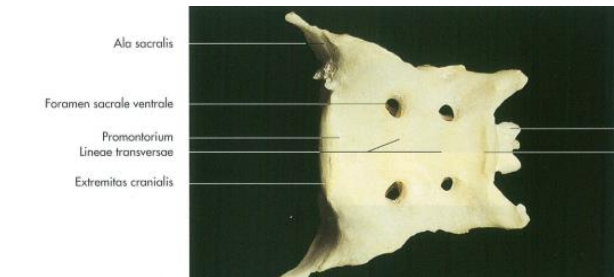
SACRAL VERTEBRAE (VERTEBRAE SACRALES)

SHAPE OF OS SACRUM (SACRUM, SACRAL BONE):

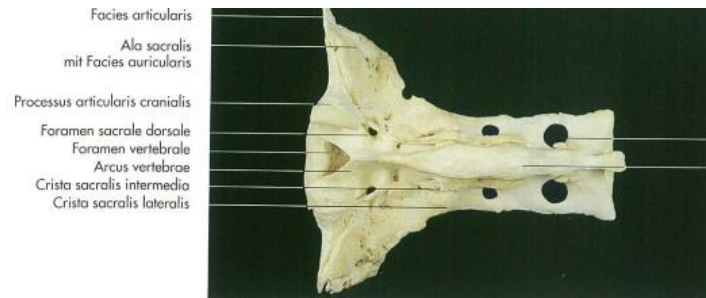
1. in carnivores – rectangular
2. in other species - triangular



Sacrum, Ca., dorsal aspect



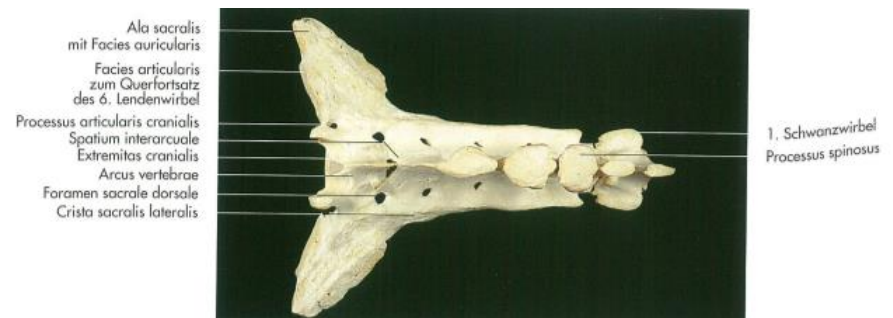
Sacrum, Ca., ventral aspect



Sacrum, Bo., dorsal aspect



Sacrum, Bo., lateral aspect



Sacrum, Eq., dorsal aspect



Sacrum, Eq., dorsal aspect

SACRAL VERTEBRAE (VERTEBRAE SACRALES)

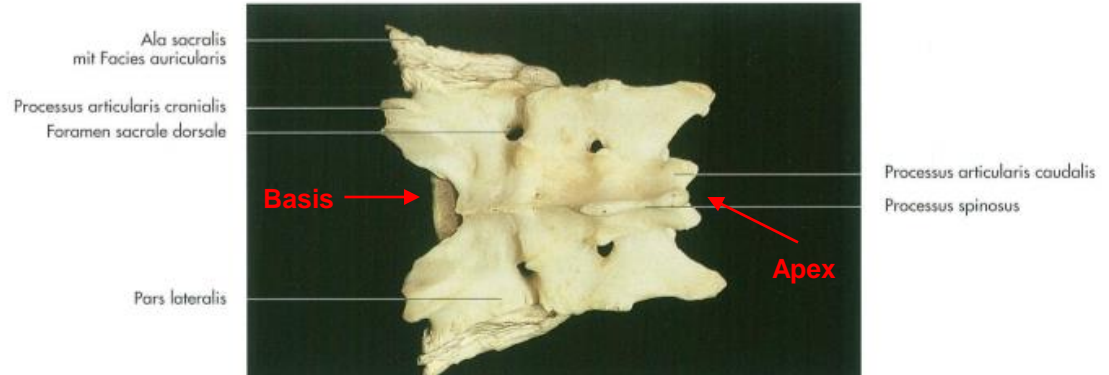
PARTS OF OS SACRUM (SACRUM, SACRAL BONE):

1. BASIS OSSIS SACRI

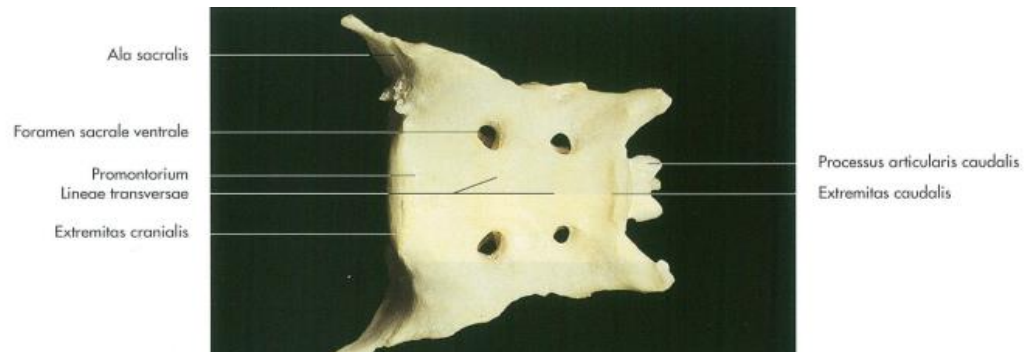
- directed cranially

2. APEX OSSIS SACRI:

- smaller
- lies caudally



Sacrum, Ca., dorsal aspect



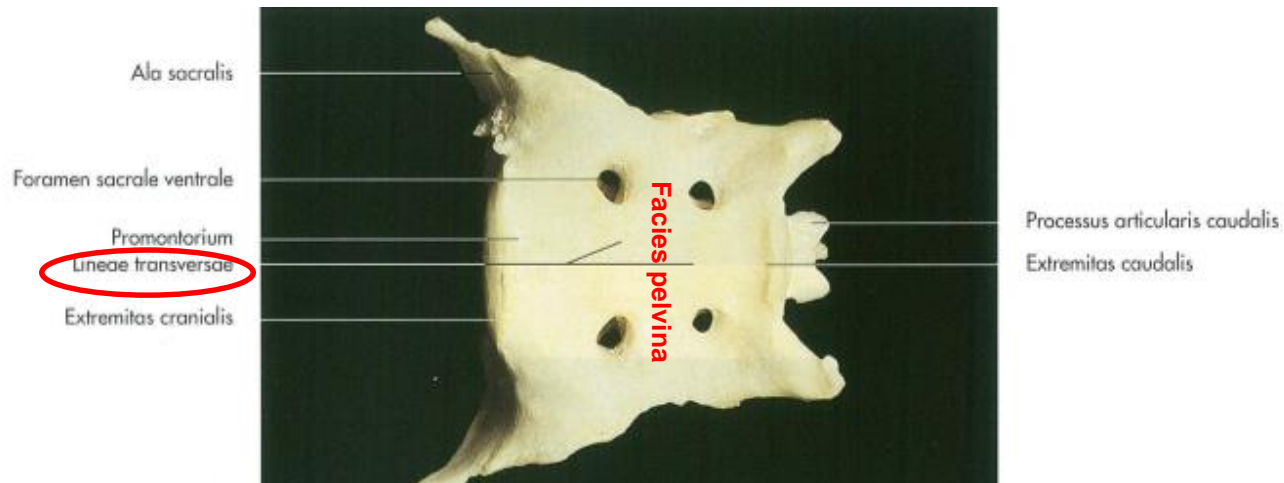
Sacrum, Ca., ventral aspect

SACRAL VERTEBRAE (VERTEBRAE SACRALES)

PARTS OF OS SACRUM (SACRUM, SACRAL BONE):

3. FACIES PELVINA:

- fusion of the vertebral bodies – recognized as LINEA TRANSVERSAE
- the ventral crest absent



Sacrum, Ca., ventral aspect

SACRAL VERTEBRAE (VERTEBRAE SACRALES)

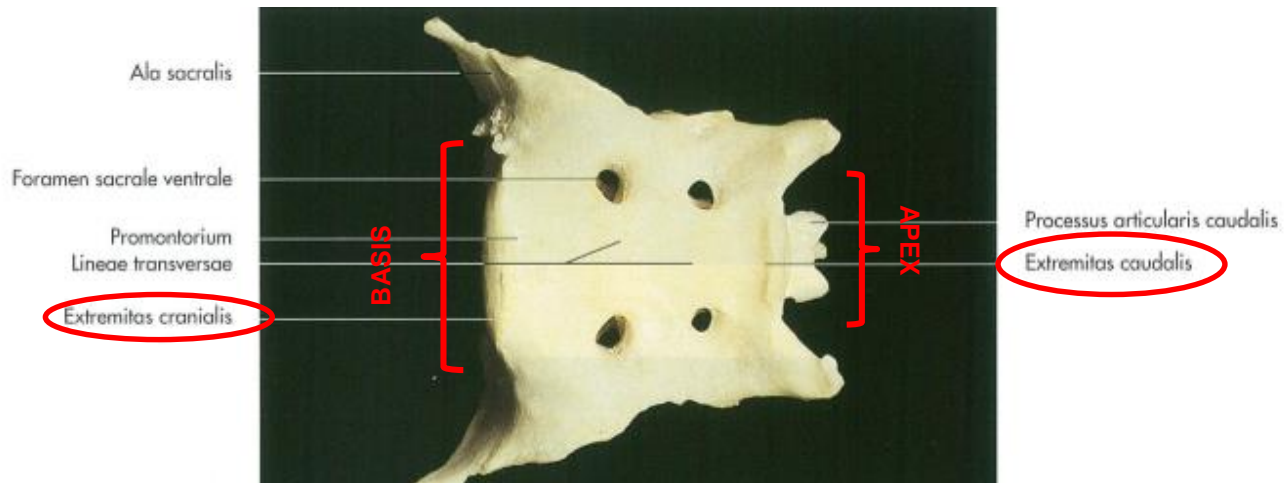
PARTS OF OS SACRUM (SACRUM, SACRAL BONE):

4. EXTREMITAS CRANIALIS:

- only on the 1st sacral vertebra

5. EXTREMITAS CAUDALIS:

- only on the last sacral vertebra



Sacrum, Ca., ventral aspect

SACRAL VERTEBRAE (VERTEBRAE SACRALES)

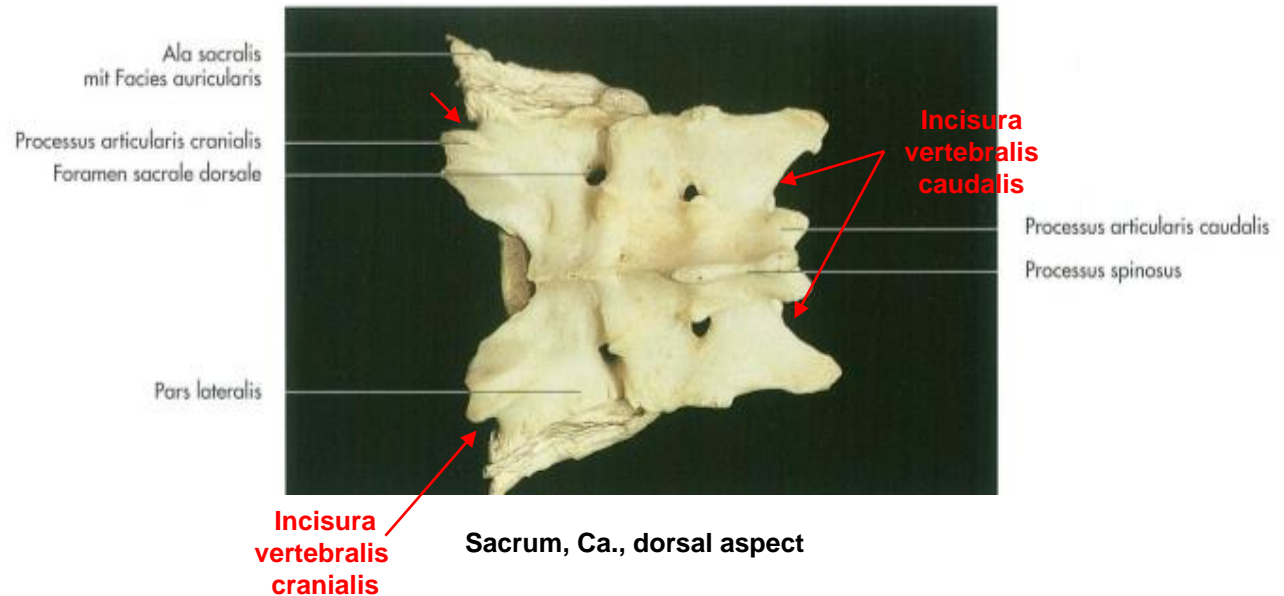
PARTS OF OS SACRUM (SACRUM, SACRAL BONE):

6. INCISURA VERETBRALIS CRANIALIS:

- only on the 1st sacral vertebra

7. INCISURA VERTEBRALIS CAUDALIS:

- only on the last sacral vertebra

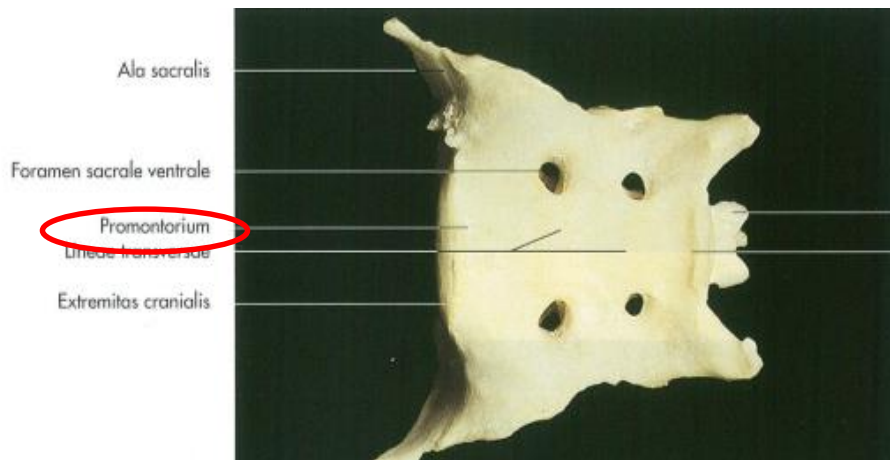


SACRAL VERTEBRAE (VERTEBRAE SACRALES)

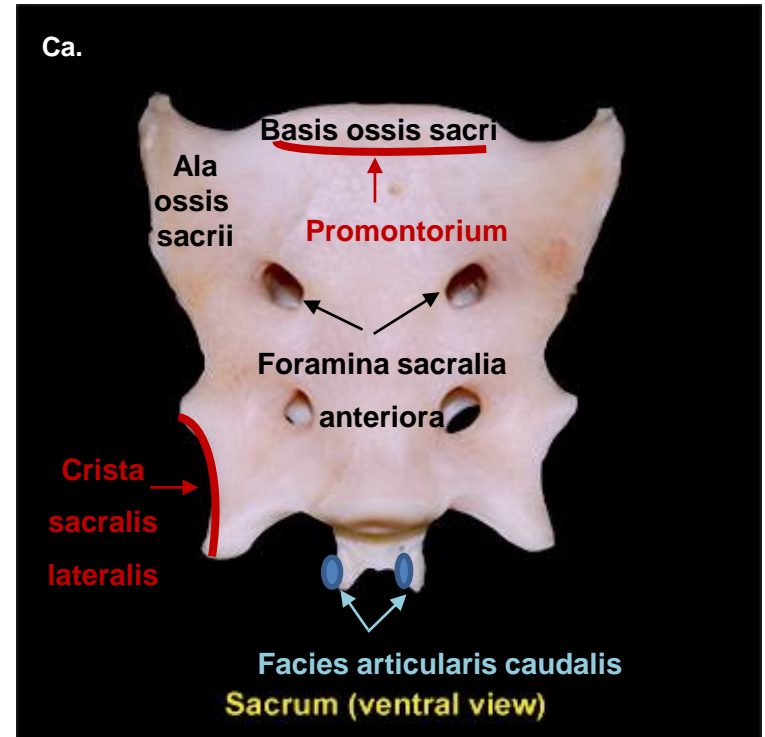
PARTS OF OS SACRUM (SACRUM, SACRAL BONE):

8. PROMONTORIUM:

- the ventral rim of the 1st sacral vertebral body
- projects forwards and downwards



Sacrum, Ca., ventral aspect



http://www.onemedicine.tuskegee.edu/CanineOsteology/Vertebral_column/sacrum.html

Processus articularis caudalis

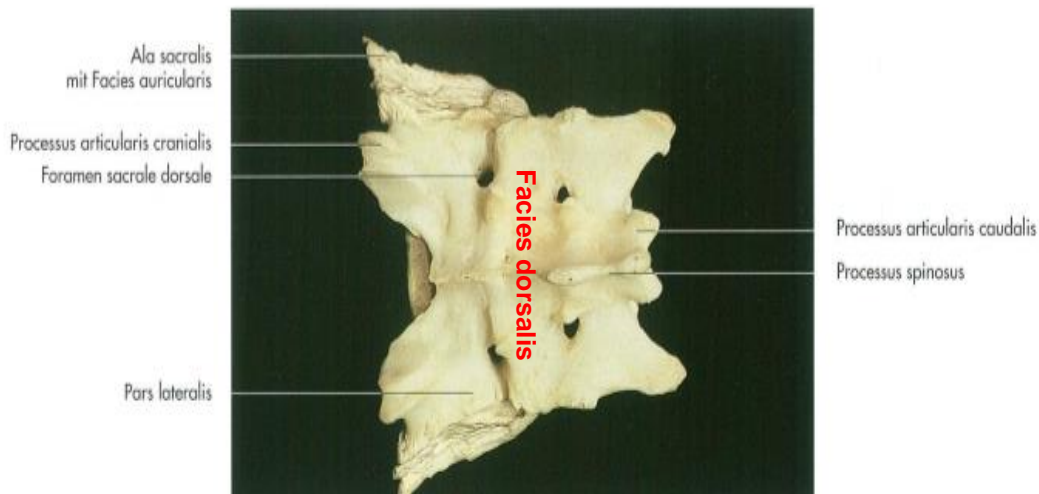
Extremitas caudalis

SACRAL VERTEBRAE (VERTEBRAE SACRALES)

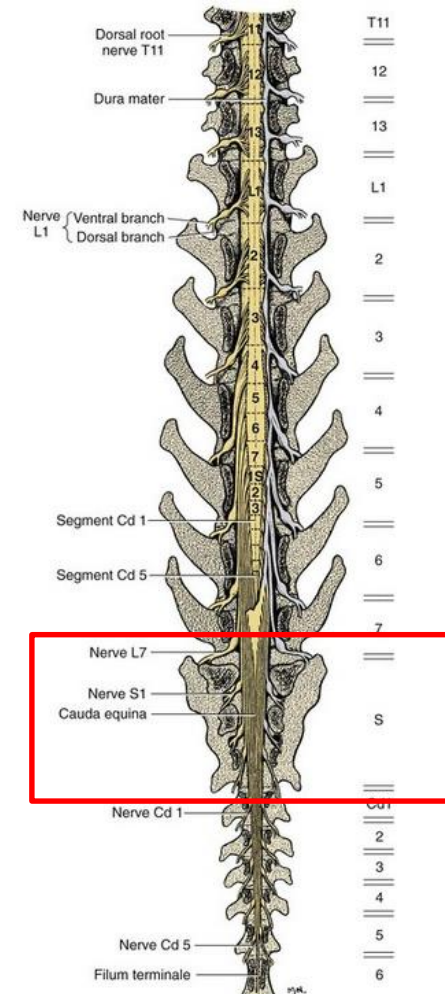
PARTS OF OS SACRUM (SACRUM, SACRAL BONE):

9. SACRAL CANAL (CANALIS SACRALIS):

- the vertebral arches of the dorsal surfaces fused



Sacrum, Ca., dorsal aspect

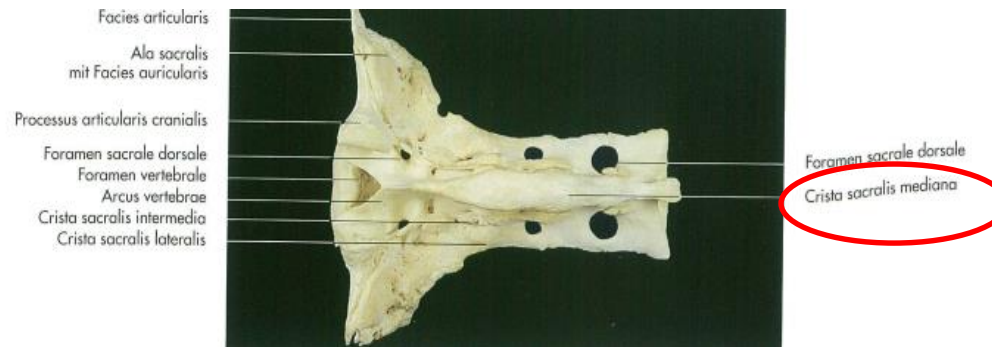


SACRAL VERTEBRAE (VERTEBRAE SACRALES)

PARTS OF OS SACRUM (SACRUM, SACRAL BONE):

10. PROCESSUS SPINOSUS on FACIES DORSALIS

- directed caudally
- **in ox, in older horses fused along their entire length to form the CRISTA SACRALIS MEDIANA**



Sacrum, Bo., dorsal aspect



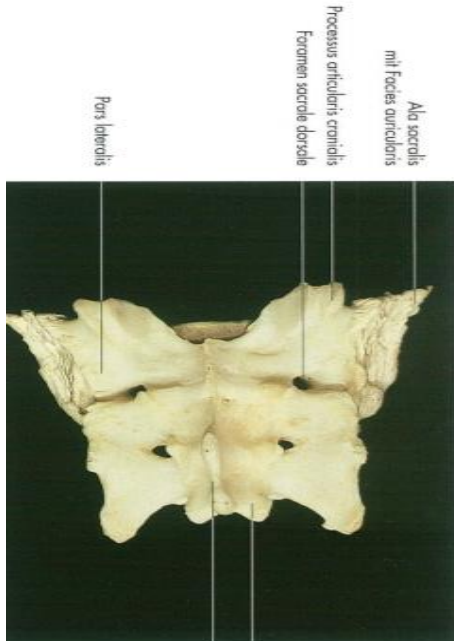
Sacrum, Bo., lateral aspect

SACRAL VERTEBRAE (VERTEBRAE SACRALES)

PARTS OF OS SACRUM (SACRUM, SACRAL BONE):

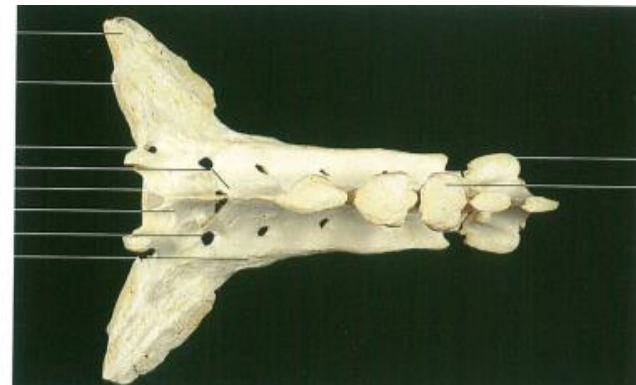
10. PROCESSUS SPINOSUS on FACIES DORSALIS

- **in carnivores, horses – only the base of the processes are fused, the dorsal parts remain separate**, expanded into tuberosities (Tuberositas processi spinosi)



Sacrum, Ca., dorsal aspect

Ala sacralis mit Facies auricularis
 Facies articularis zum Querfortsatz des 6. Lendenwirbel
 Processus articularis cranialis
 Spatium interarcuale
 Extremitas cranialis
 Arcus vertebrae
 Foramen sacrale dorsale
 Crista sacralis lateralis



Sacrum, Eq., dorsal aspect

Processus articularis cranialis
 Foramen sacrale dorsale
 Facies articularis zum Querfortsatz des 6. Lendenwirbel
 Ala sacralis mit Facies auricularis



Sacrum, Eq., dorsal aspect

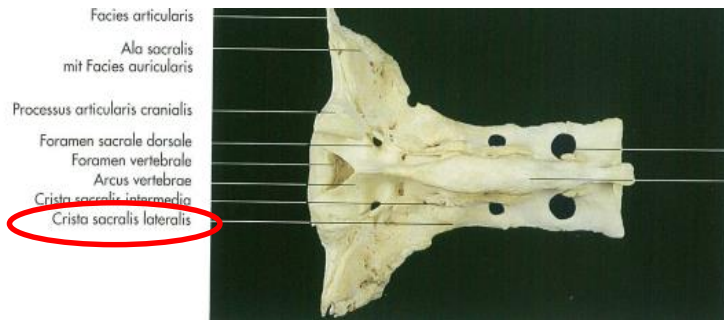
SACRAL VERTEBRAE (VERTEBRAE SACRALES)

PARTS OF OS SACRUM (SACRUM, SACRAL BONE):

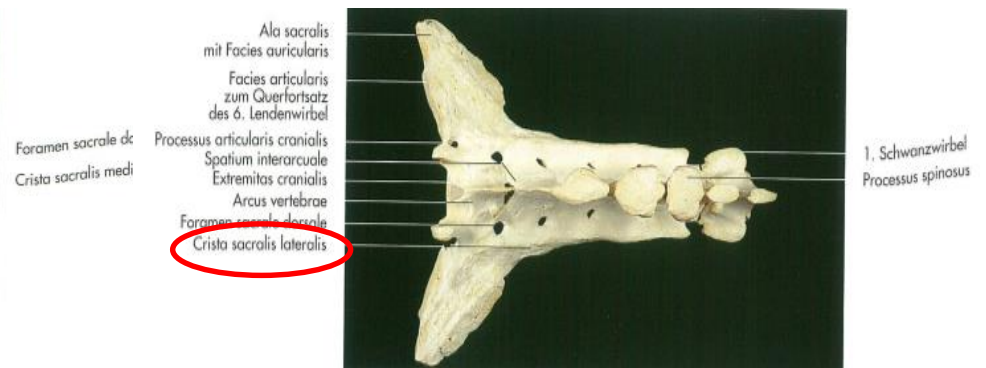
11. PARS LATERALIS:

- formed by the fused transverse processes

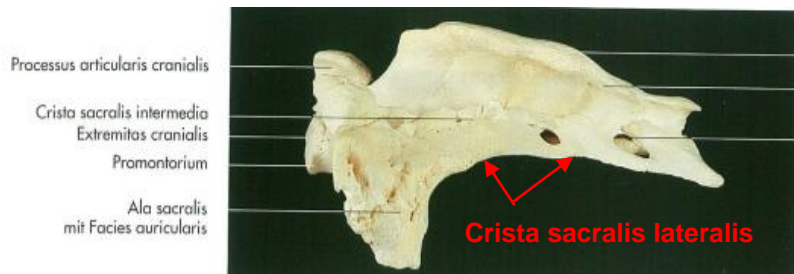
-12. CRISTA SACRALIS LATERALIS (lateral sacral crest)



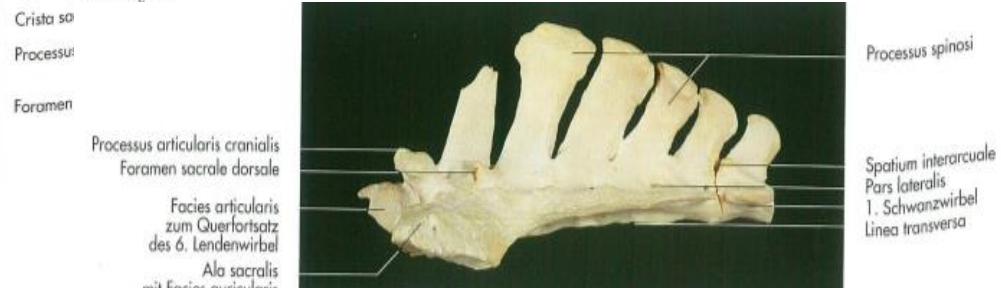
Sacrum, Bo., dorsal aspect



Sacrum, Eq., dorsal aspect



Sacrum, Bo., lateral aspect



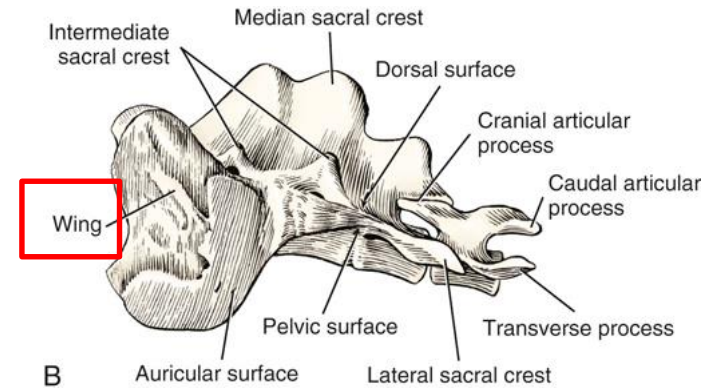
Sacrum, Eq., dorsal aspect

SACRAL VERTEBRAE (VERTEBRAE SACRALES)

PARTS OF OS SACRUM (SACRUM, SACRAL BONE):

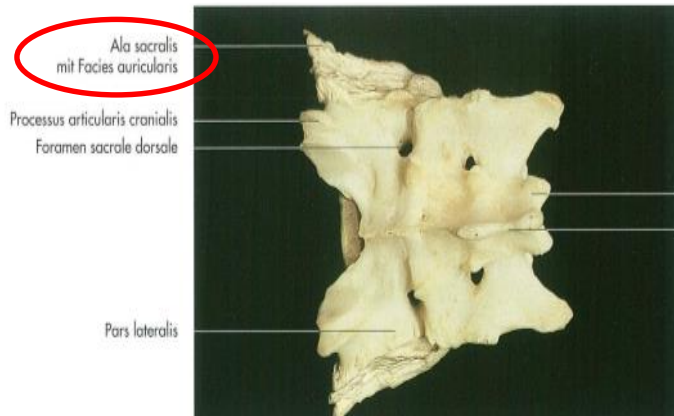
13. ALAE SACRALES (SACRAL WINGS):

- formed by the transverse processes of the 1st sacral vertebra

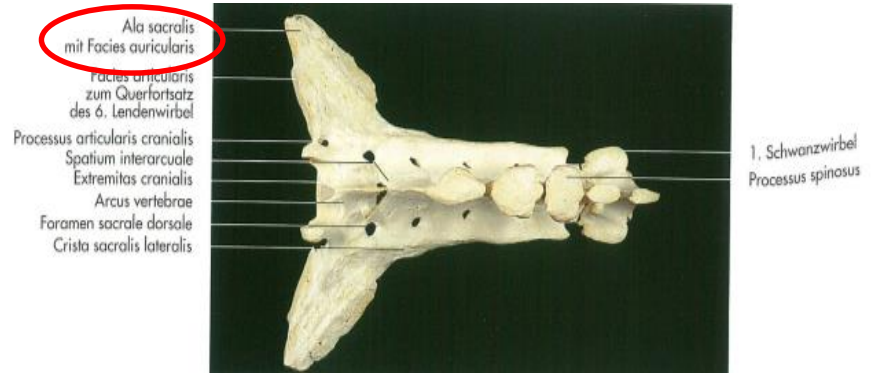


sacrum and caudal 1 or Cd1 vertebra from a lateral view (B)

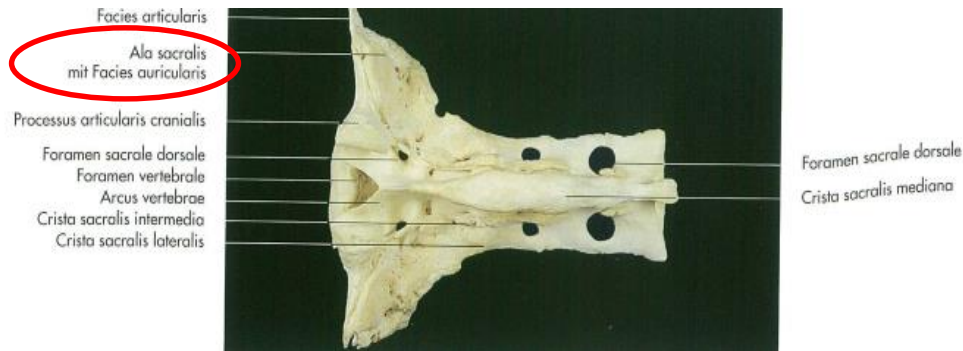
<https://veteriankey.com/canine-anatomy/>



Sacrum, Ca., dorsal aspect



Sacrum, Eq., dorsal aspect



Sacrum, Bo., dorsal aspect

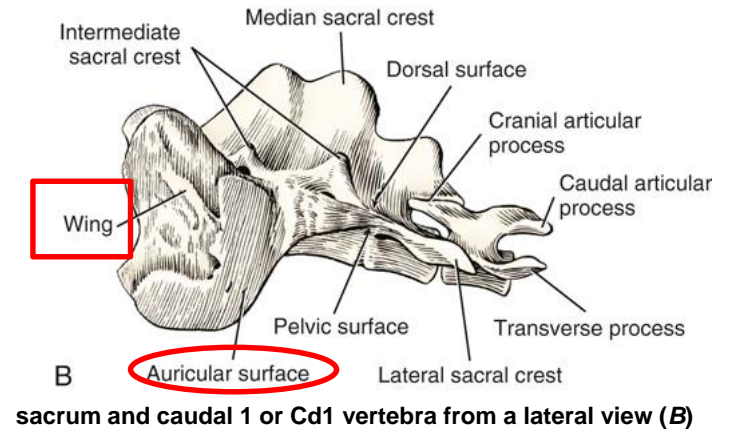
SACRAL VERTEBRAE (VERTEBRAE SACRALES)

PARTS OF OS SACRUM (SACRUM, SACRAL BONE):

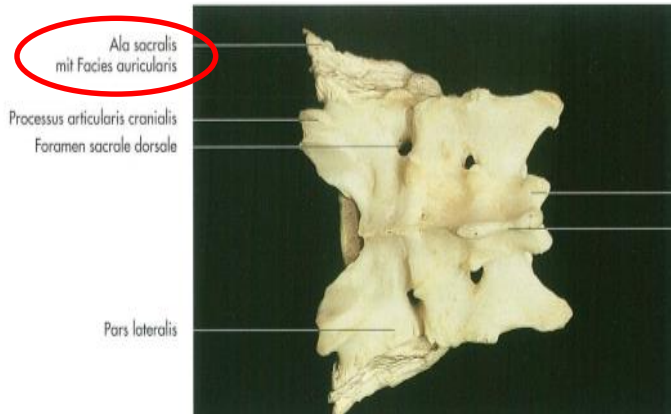
13. ALAE SACRALES (SACRAL WINGS):

a. FACIES AURICULARIS (AURICULAR SURFACE):

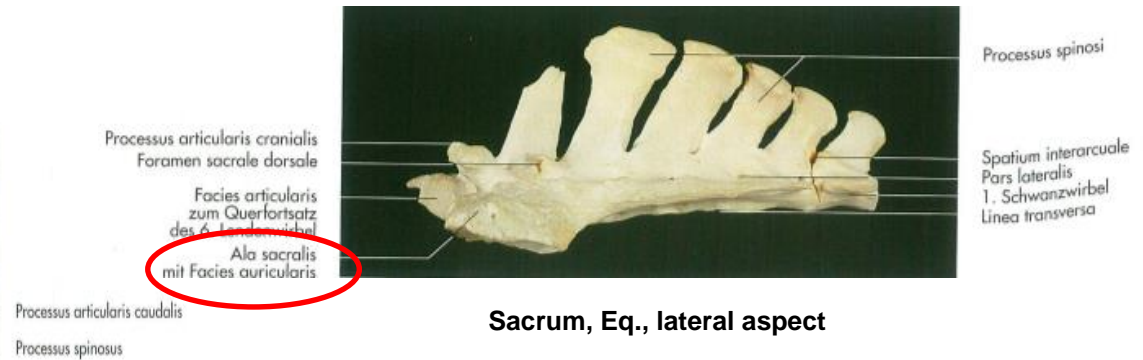
- covered with cartilage
- articulates with similar surface of the wing of the ilium



<https://veteriankey.com/canine-anatomy/>



Sacrum, Ca., dorsal aspect



Sacrum, Eq., lateral aspect



Sacrum, Bo., lateral aspect

SACRAL VERTEBRAE (VERTEBRAE SACRALES)

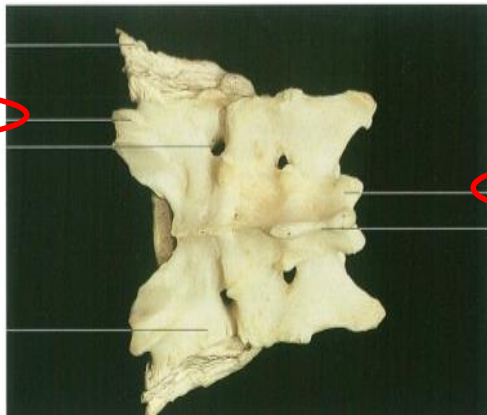
PARTS OF OS SACRUM (SACRUM, SACRAL BONE):

14. PROCESSUS ARTICULARIS CRANIALIS

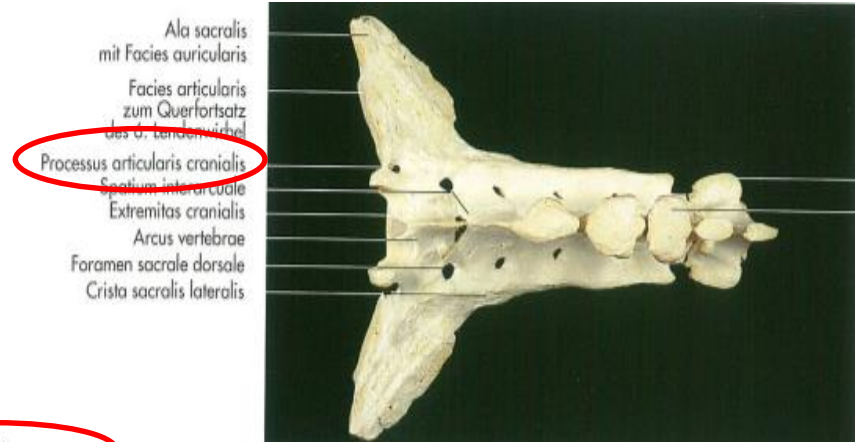
- on the 1st sacral vertebra

15. PROCESSUS ARTICULARIS CAUDALIS:

- on the last sacral vertebra



Sacrum, Ca., dorsal aspect

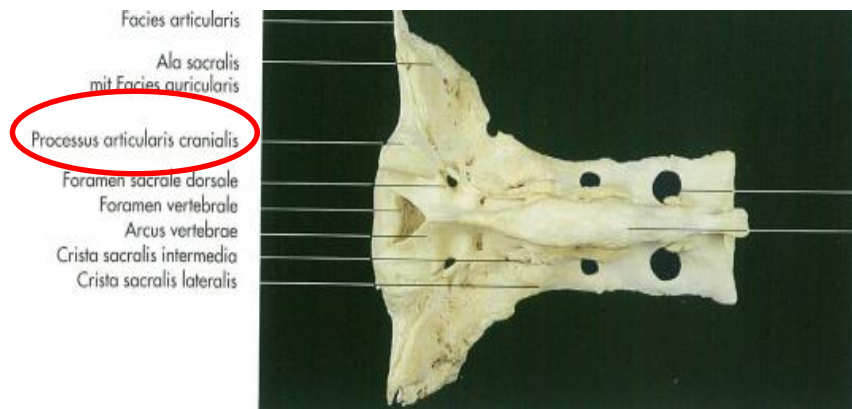


Sacrum, Eq., dorsal aspect

1. Schwanzwirbel
Processus spinosus

Processus articularis caudalis

Processus spinosus



Sacrum, Bo., dorsal aspect

Foramen sacrale dorsale

Crista sacralis mediana

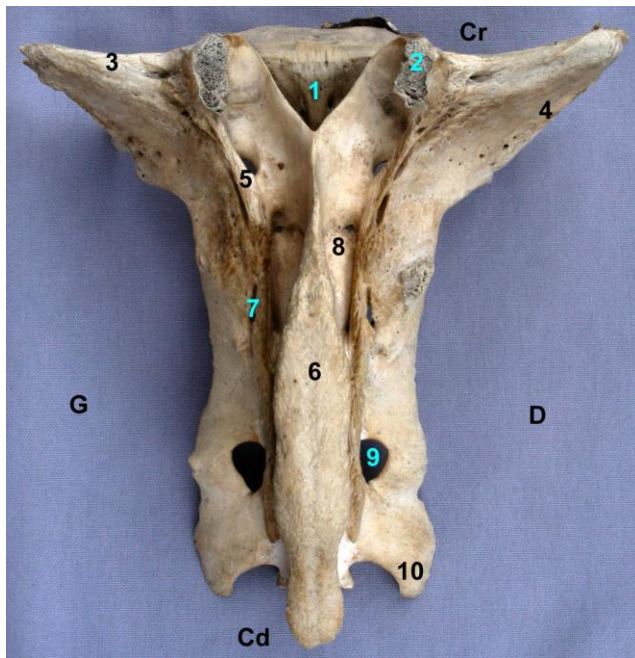
SACRAL VERTEBRAE (VERTEBRAE SACRALES)

PARTS OF OS SACRUM (SACRUM, SACRAL BONE):

IN OX:

CRISTA SACRALIS INTERMEDIA:

- formed by the rudimentary, fused articular processes



7: crista sacralis intermedia

Facies articularis
Ala sacralis
mit Facies auricularis
Processus articularis cranialis
Foramen sacrale dorsale
Foramen vertebrale
Arcus vertebrae
Crista sacralis intermedia
Crista sacralis lateralis



Sacrum, Bo., dorsal aspect

Foramen sacrale dorsale
Crista sacralis mediana

Processus articularis cranialis
Crista sacralis intermedia
Extremitas cranialis
Promontorium
Ala sacralis
mit Facies auricularis



Sacrum, Bo., lateral aspect

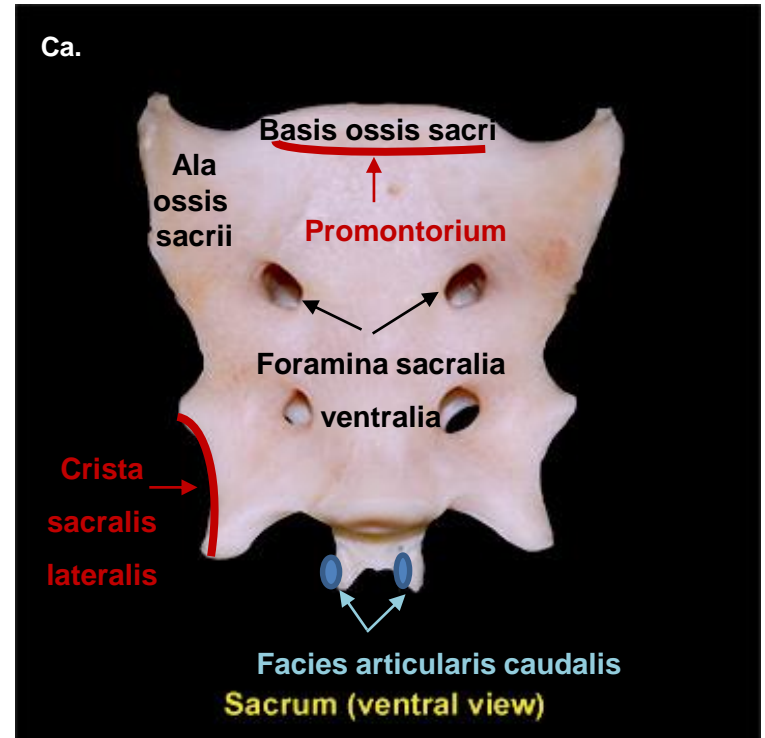
Crista sacralis mediana
Processus spinosus
Foramen sacrale dorsale

SACRAL VERTEBRAE (VERTEBRAE SACRALES)

PARTS OF OS SACRUM (SACRUM, SACRAL BONE):

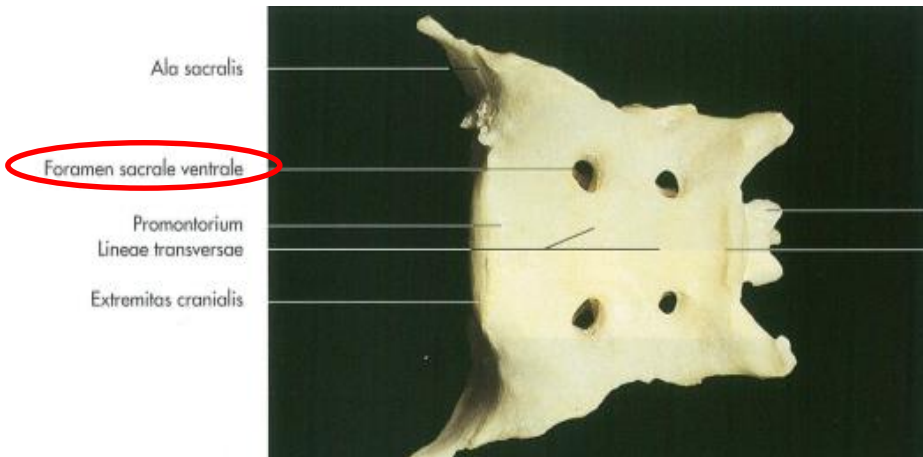
16. FORAMINA SACRALIA VENTRALIA:

- pelvic sacral foramen
- on the facies pelvina
- ventral opening of the sacral canal



http://www.onemedicine.tuskegee.edu/CanineOsteology/Vertebral_column/sacrum.html

Processus articularis caudalis
Extremitas caudalis



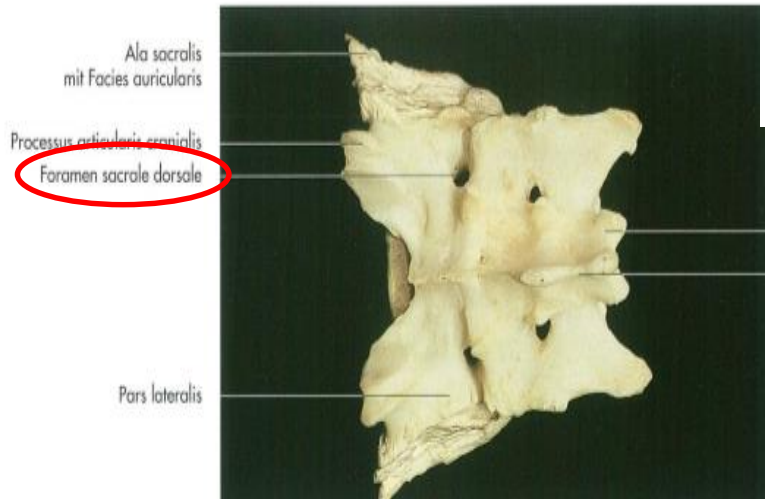
Sacrum, Ca., ventral aspect

SACRAL VERTEBRAE (VERTEBRAE SACRALES)

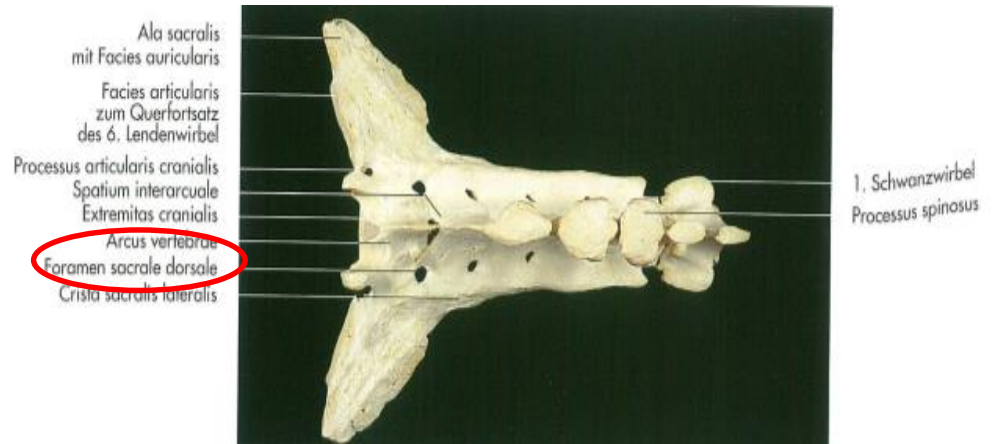
PARTS OF OS SACRUM (SACRUM, SACRAL BONE):

16. FORAMINA SACRALIA DORSALIA:

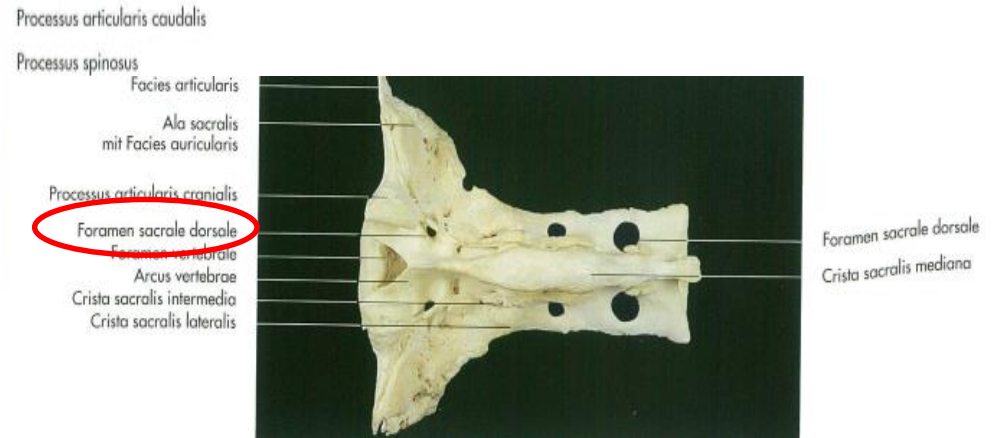
- dorsal sacral foramen
- on the facies dorsalis
- dorsal opening of the sacral canal



Sacrum, Ca., dorsal aspect



Sacrum, Eq., dorsal aspect

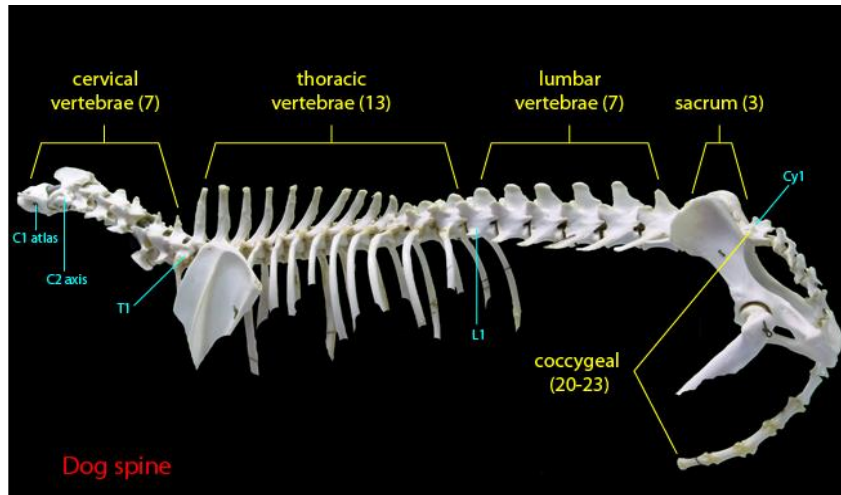


Sacrum, Bo., dorsal aspect

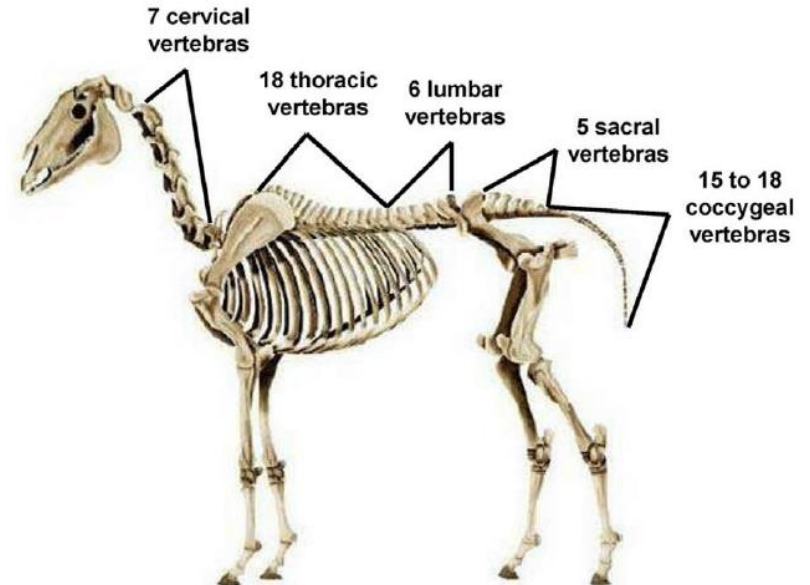
CAUDAL (COCCYGEAL) VERTEBRAE (VERTEBRAE CAUDALES)

THE NUMBER OF THE CAUDAL VERTEBRAE:

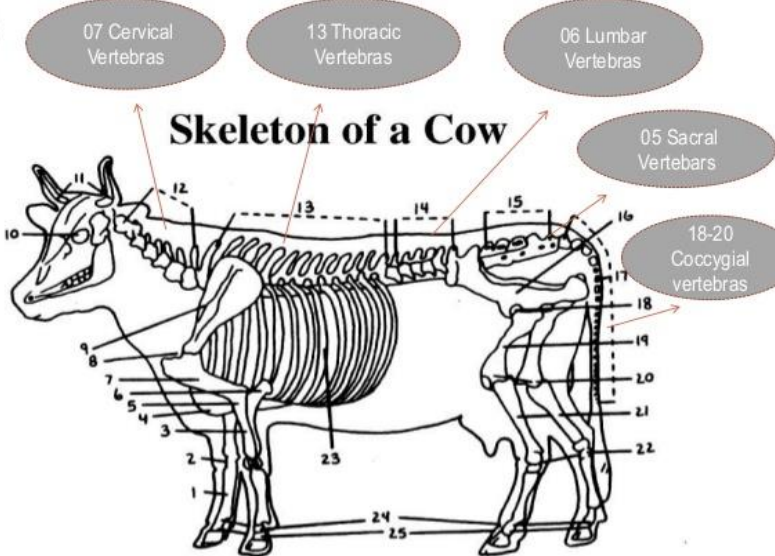
1. In carnivores, in pigs 20 – 23
2. In sheep 3 – 24
3. In goats 12 – 16
4. In cattle 18 – 20
5. In horses 15 - 21



<https://hu.pinterest.com/pin/159877855502035893/>



<https://www.researchgate.net/figure/The-five-vertebral-areas-cervical-thoracic-lumbar-sacral-and-coccyge>



Model Agricultural Core Curriculum: Supplement
University of California, Davis

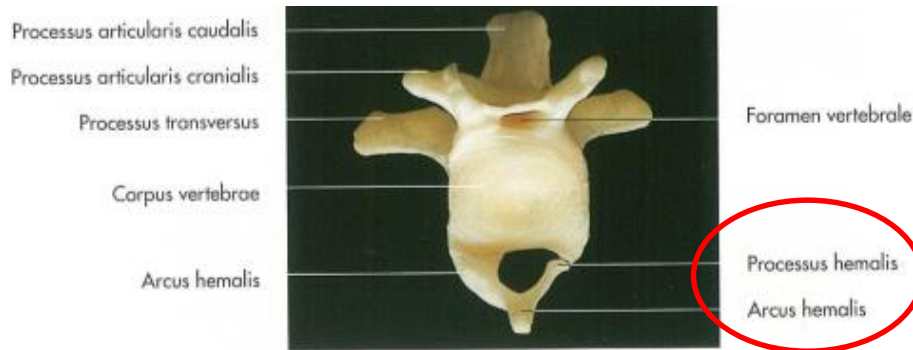
248.T.1

<https://www.slideshare.net/AsadAbdulHannan/comparative-study-of-vertebral-column-of-camel-ox-and-horse>

CAUDAL (COCCYGEAL) VERTEBRAE (VERTEBRAE CAUDALES)

In carnivores, cattles:

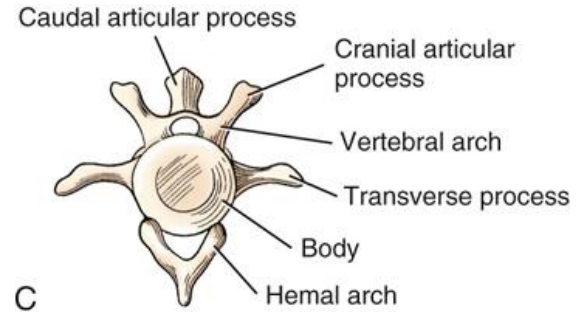
1. PROCESSUS HEAMALES
2. ARCUS HAEMALIS – fusion of the procc. heemales



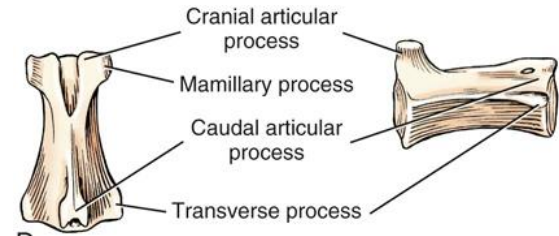
Cd5, Ca., cranial aspect



Cd4., Ca., ventral aspect



C



D

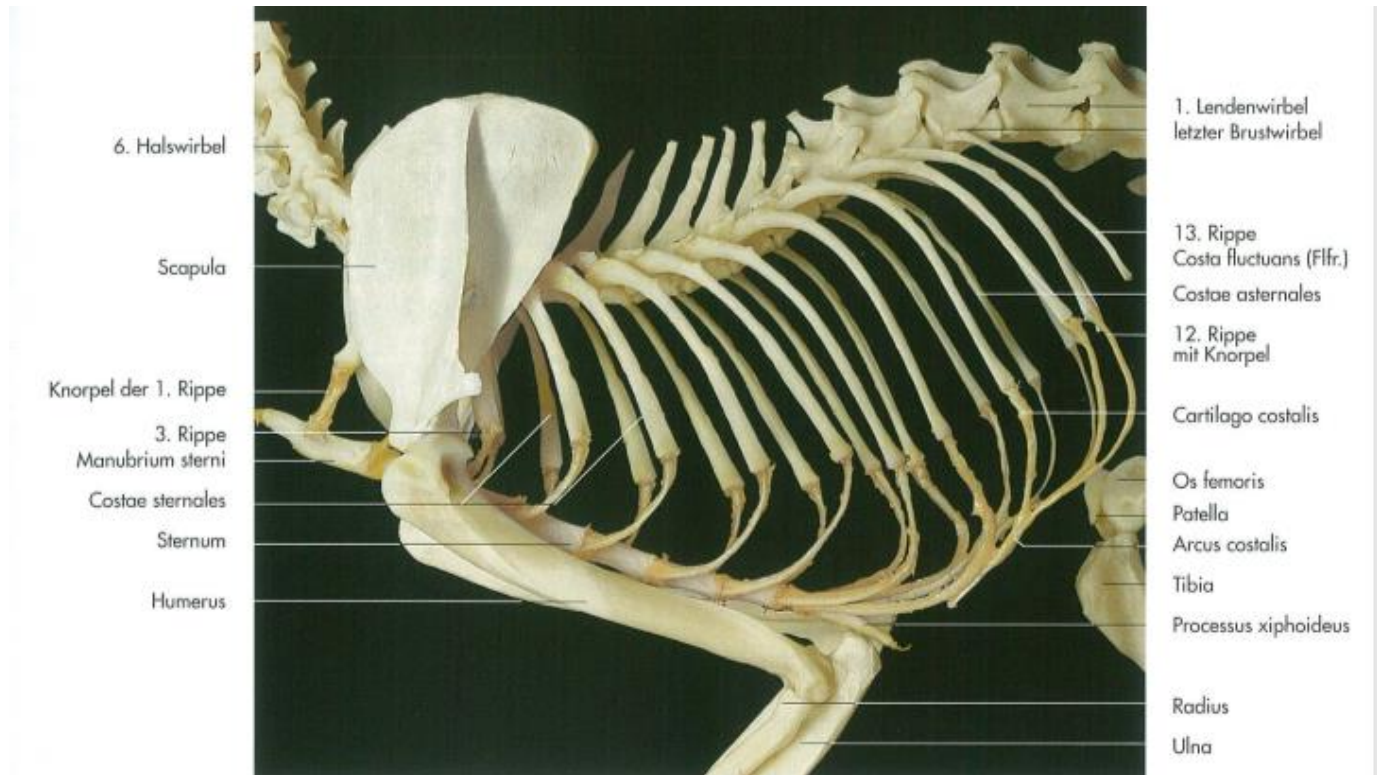
Cd4 vertebra from a cranial view (C), and Cd6 vertebra from a dorsal view (D). (From Evans HE: *Miller's anatomy of the dog*, ed 4, Philadelphia, 2013, WB Saunders.)

<https://veteriankey.com/canine-anatomy/>

SKELETON THORACIS

formed by the:

- a) thoracis vertebrae dorsally
- b) ribs, costal cartilages laterally
- c) sternum ventrally



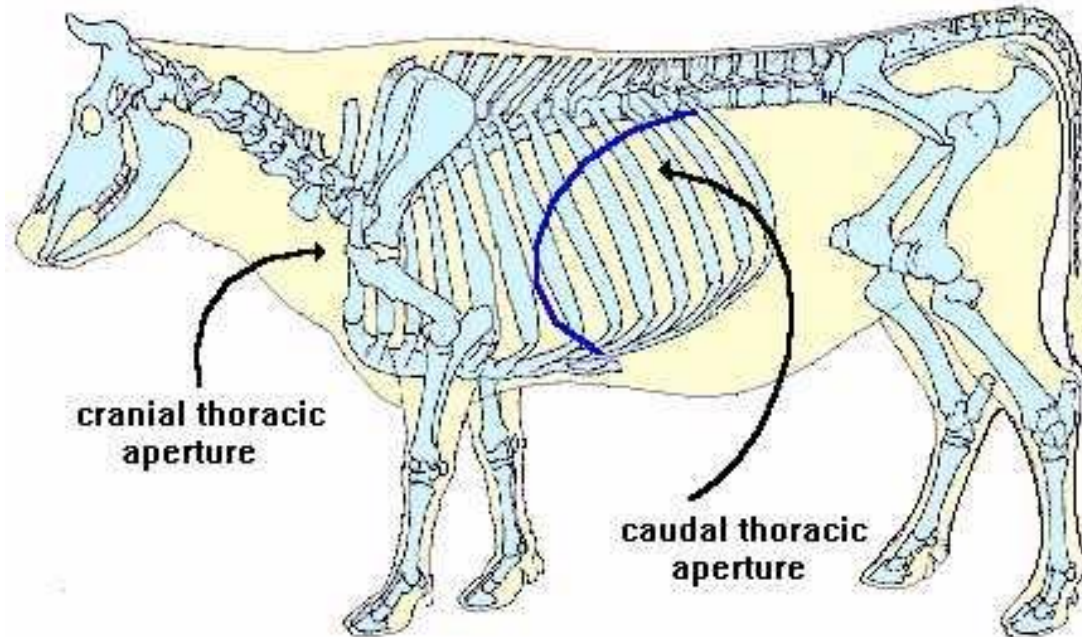
Skeleton of the thorax, Fe, lateral aspect

THORAX

- laterally compressed cone

forms:

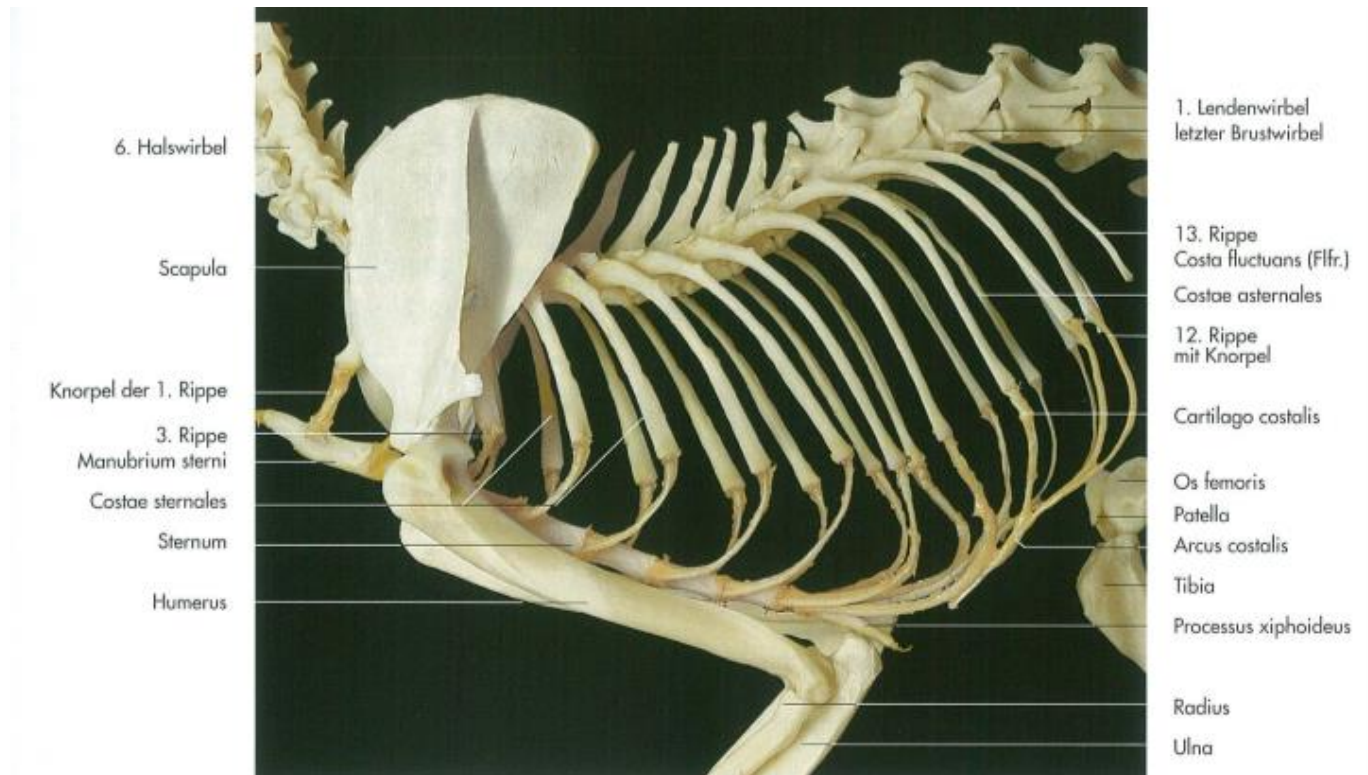
1. the wall of the thoracic cavity
 - a. anterior opening (APERTURA THORACIS CRANIALIS)
 - b. posterior opening (APERTURA THORACIS CAUDALIS)



THORAX

LATERAL SURFACE:

- provides large areas for the attachment of the supporting forelimb



Skeleton of the thorax, Fe, lateral aspect

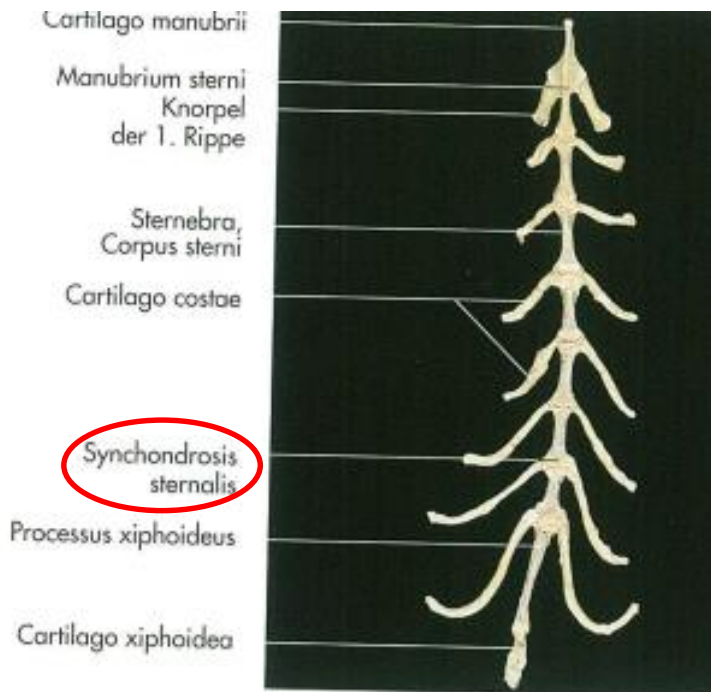
SKELETON THORACIS

STERNUM:

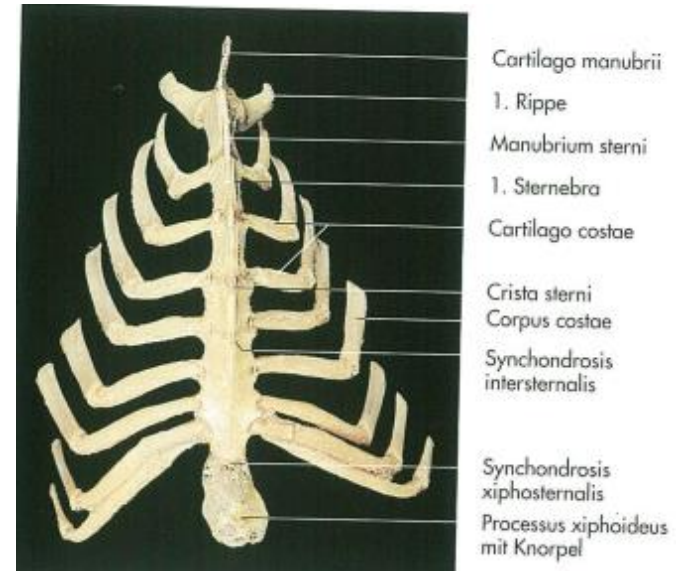
- median, segmental bone

SEGMENTS or STERNEBRAE:

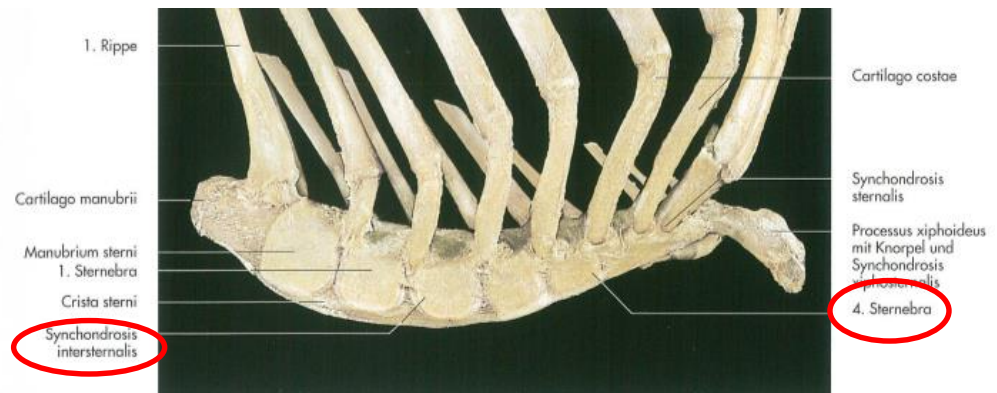
- united by cartilages forming the synchondroses sternales



Sternum, Fe., dorsal aspect



Sternum, Eq., ventral aspect



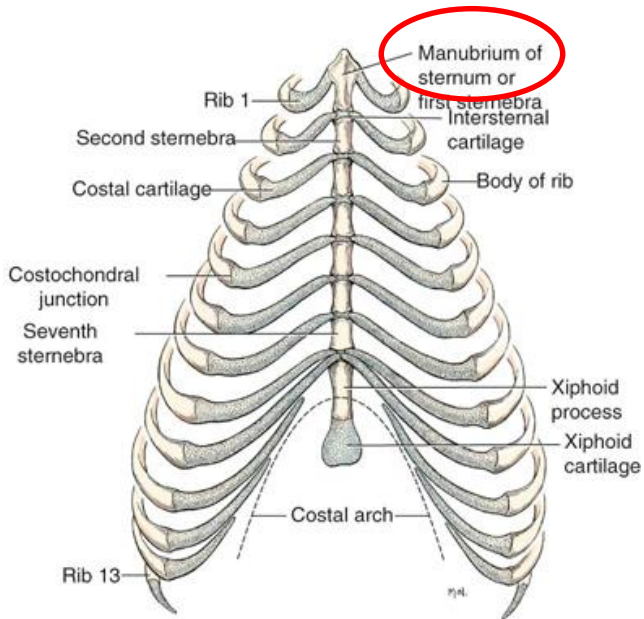
Sternum, Eq., lateral aspect

SKELETON THORACIS

PARTS OF THE STERNUM:

1. MANUBRIUM STERNI (PRESTERNUM):

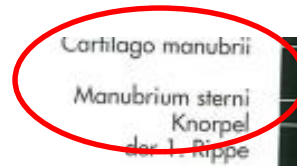
- cranial extremity
- articulation surface for the 1st pair of ribs



<https://veteriankey.com/canine-anatomy/>



Sternum, Eq., ventral aspect



Sternum, Fe., dorsal aspect

SKELETON THORACIS

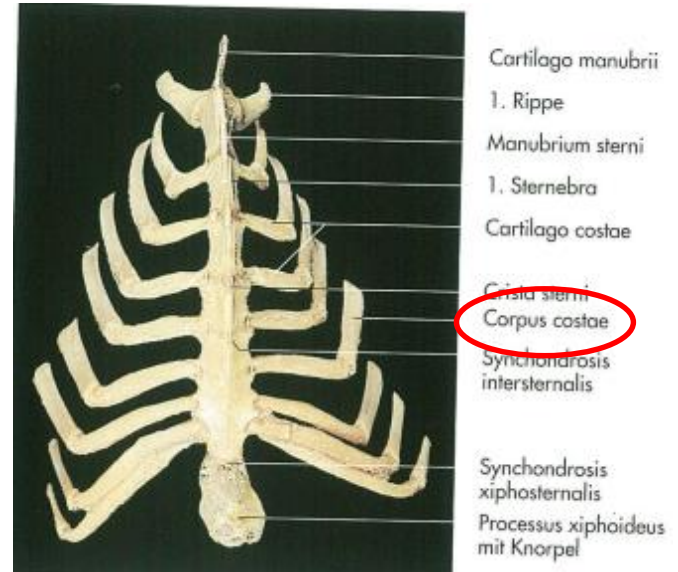
PARTS OF THE STERNUM:

2. CORPUS STERNI (MESOSTERNUM):

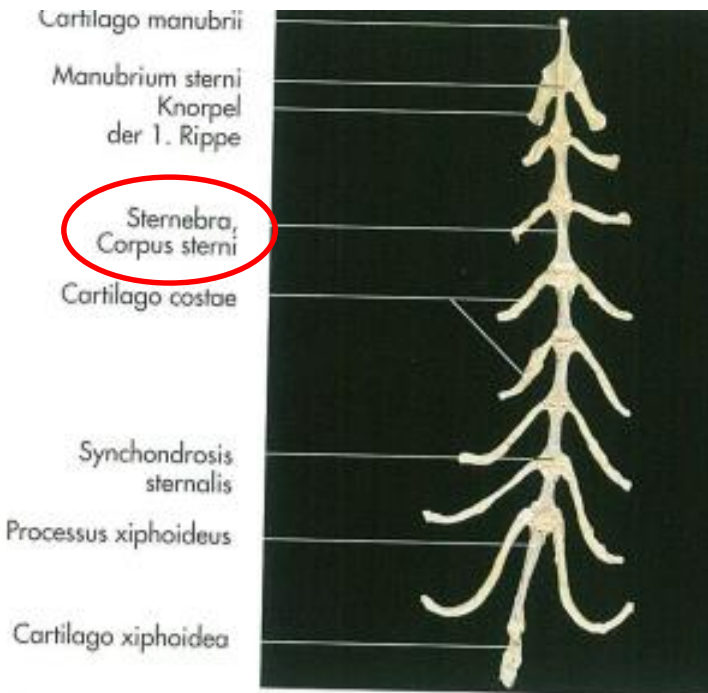
- the manubrium sterni articulates with the corpus

consists of:

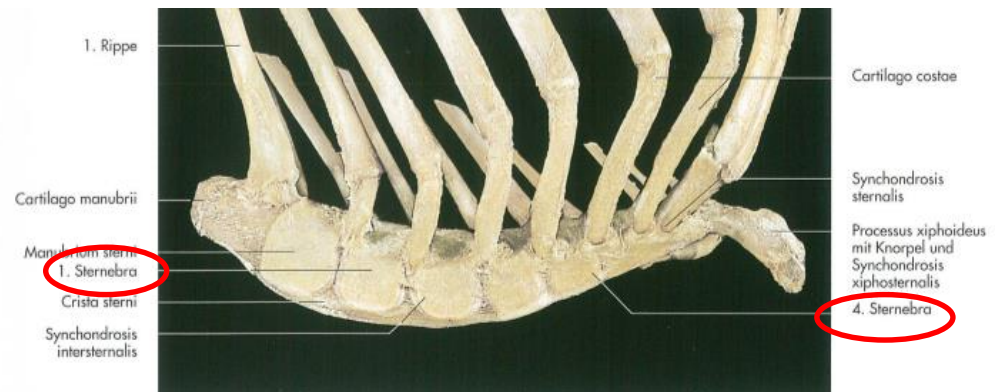
- a) in carnivores 6 sternal bones or sternebrae
- b) in ruminants and horses 5 sternal bones or sternebrae
- c) in pigs 4 sternal bones or sternebrae



Sternum, Eq., ventral aspect



Sternum, Fe., dorsal aspect



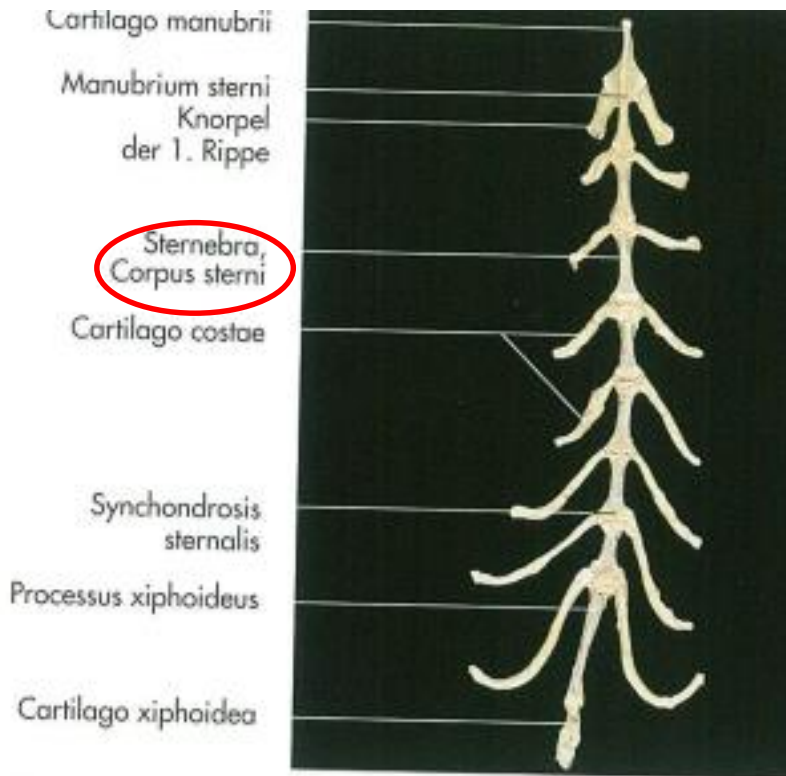
Sternum, Eq., lateral aspect

SKELETON THORACIS

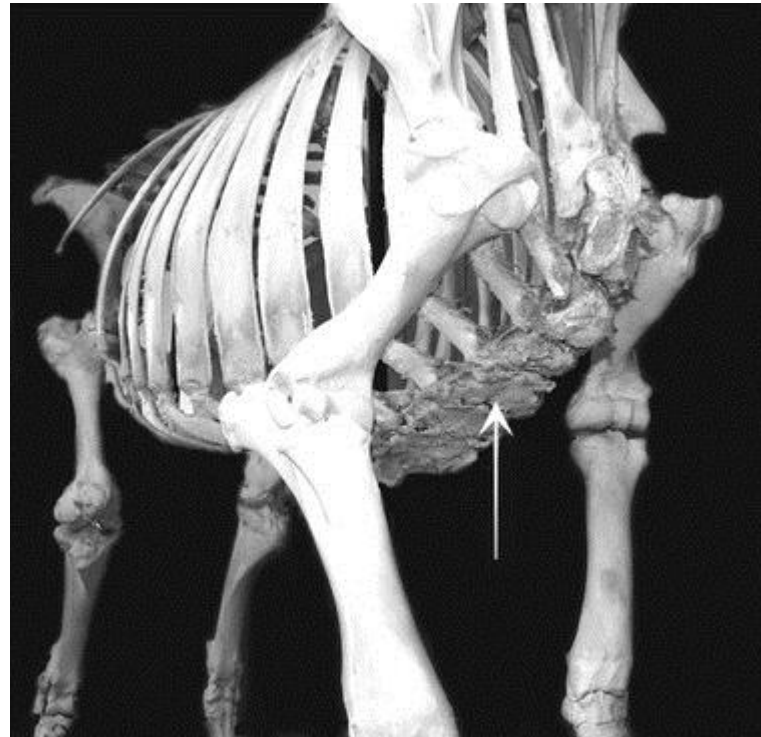
PARTS OF THE STERNUM:

2. CORPUS STERNI (MESOSTERNUM):

- a. in carnivores – rectangular shaped
- b. in ruminants – dorsoventrally flattened



Sternum, Fe., dorsal aspect



Bovine sternum

SKELETON THORACIS

PARTS OF THE STERNUM:

2. CORPUS STERNI (MESOSTERNUM):

- a. **in horses** - at the level of the 1st sternebra the sternum assumes the shape of a ship'keel (**CRISTA STERNALIS**), dorsoventrally flattened



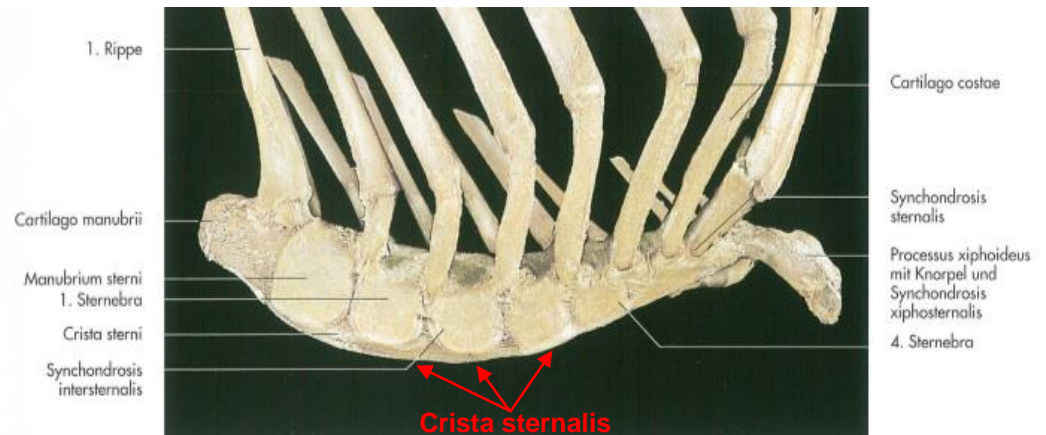
Sternum, Eq., ventral aspect

Cartilago manubrii
 1. Rippe
 Manubrium sterni
 1. Sternebra
 Cartilago costae
Crista sterni
Corpus costae
 Synchondrosis intersternalis
 Synchondrosis xiphosternalis
 Processus xiphoideus mit Knorpel



Lateral view of equine sternum

<https://veteriankey.com/collection-and-analysis-of-bone-marrow/>



Sternum, Eq., lateral aspect

1. Rippe
 Cartilago manubrii
 Manubrium sterni
 1. Sternebra
 Crista sterni
 Synchondrosis intersternalis

Cartilago costae
 Synchondrosis sternalis
 Processus xiphoideus mit Knorpel und Synchondrosis xiphosternalis
 4. Sternebra

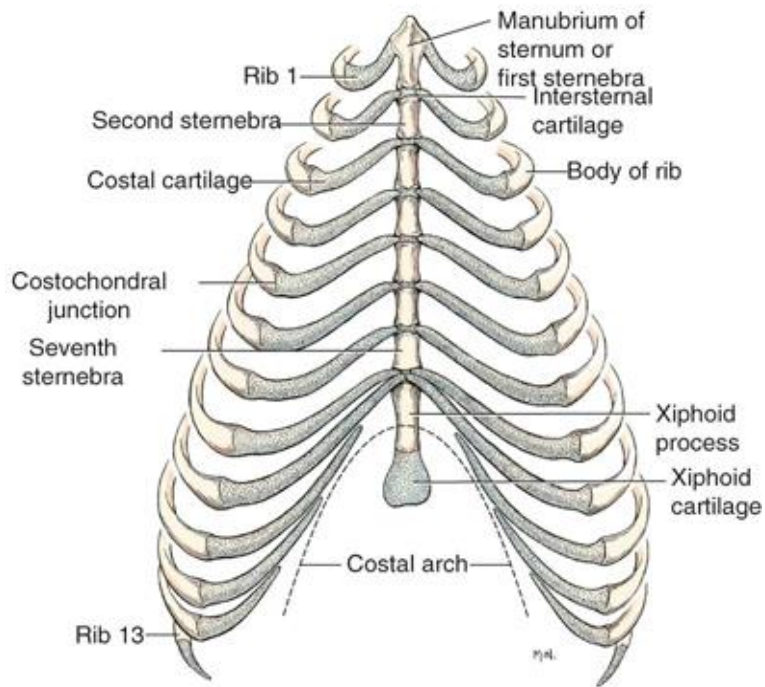
Crista sternalis

SKELETON THORACIS

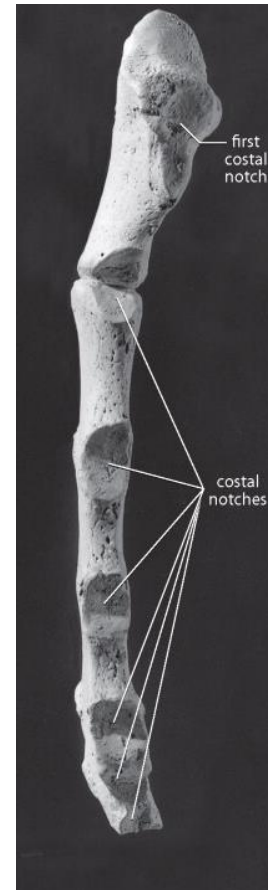
PARTS OF THE STERNUM:

2. CORPUS STERNI (MESOSTERNUM):

- **INCISURAE COSTALES (costal notches)** – articulation with the cartilages of the sternal ribs



<https://veteriankey.com/canine-anatomy/>



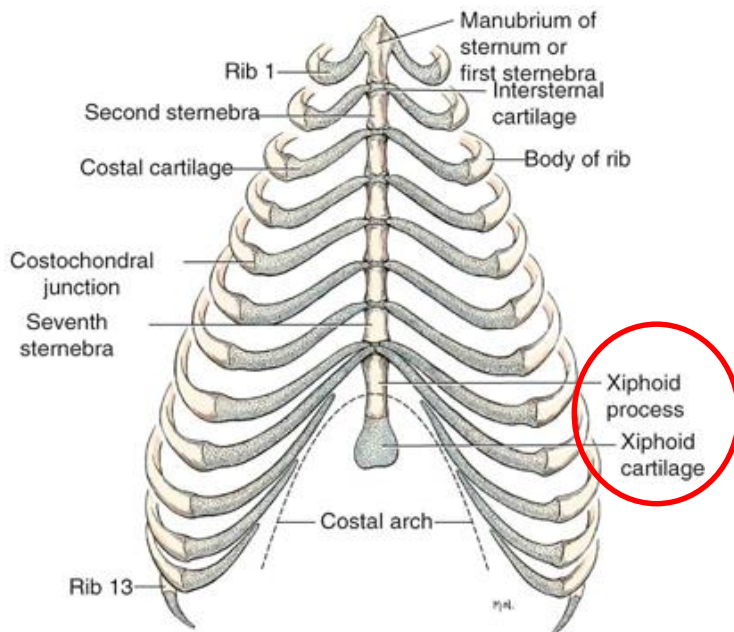
<https://www.sciencedirect.com/topics/veterinary-science-and-veterinary-medicine/sternum>

SKELETON THORACIS

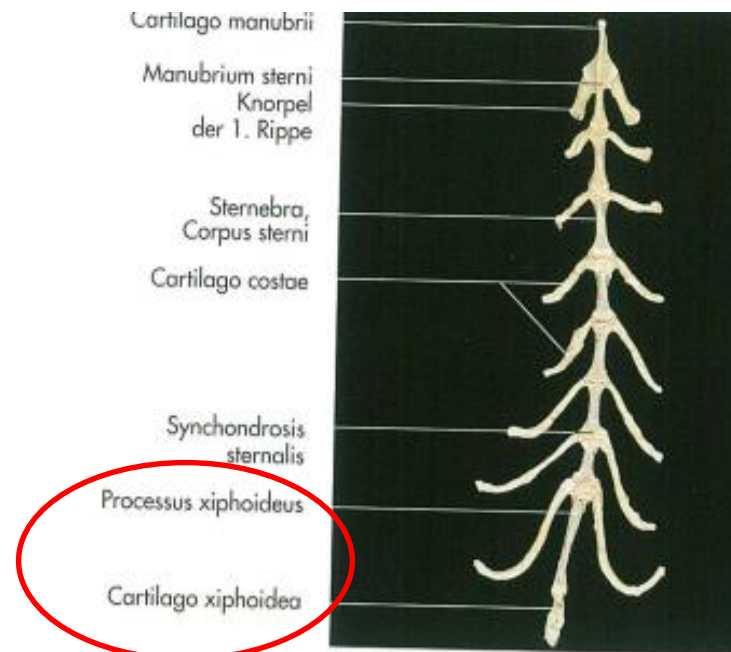
PARTS OF THE STERNUM:

3. PROCESSUS XIPHOIDEUS (XIPHOSTERNUM):

- caudal portion
- midline continuation of the sternum
- not connected with the ribs
- bears the xiphoid cartilage (Cartilago xiphoidea) – projects between the two costal arches (Regio xiphoidea)
- **the bony xiphoid process absent in horse**



<https://veteriankey.com/canine-anatomy/>



Sternum, Fe., dorsal aspect

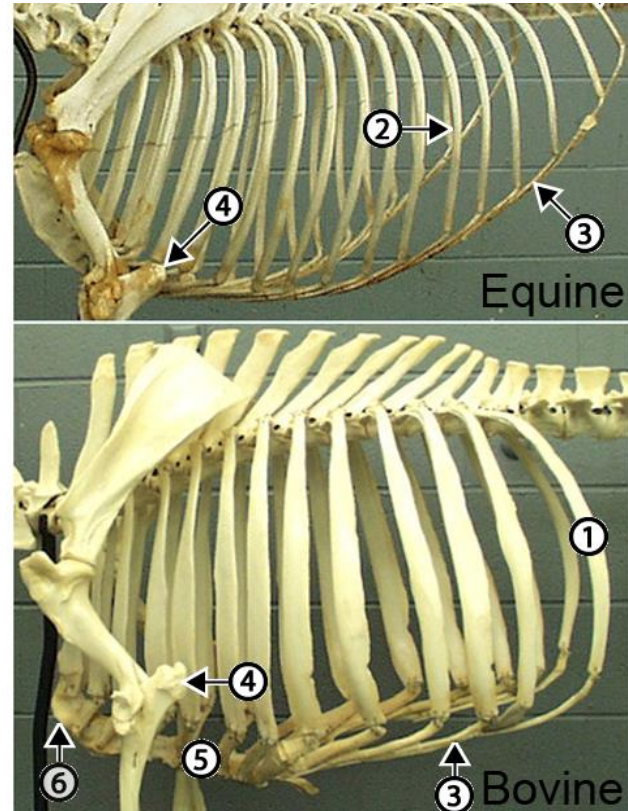
SKELETON THORACIS

RIBS (COSTAE):

- in the thoracic region remain well developed



Skeleton of the thorax, Fe, lateral aspect

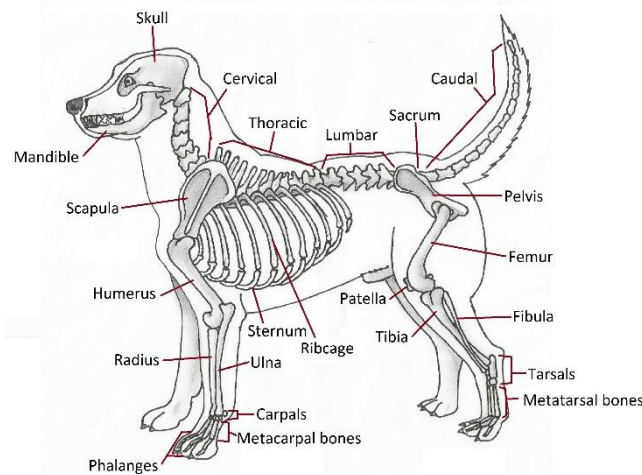


Comparative thoracic osteology. The horse has more ribs but they are thinner. The last rib (1) is shorter in the horse but the 13th rib of the horse (2) is similar in length to the bovine 13th rib (1). The costal arch (3) is much longer and more slanted in the horse. The bovine thorax is deeper than that of the horse and therefore the bovine sternum (5) is ventral to the olecranon (4). The cranial part of the bovine sternum forms the brisket (6).

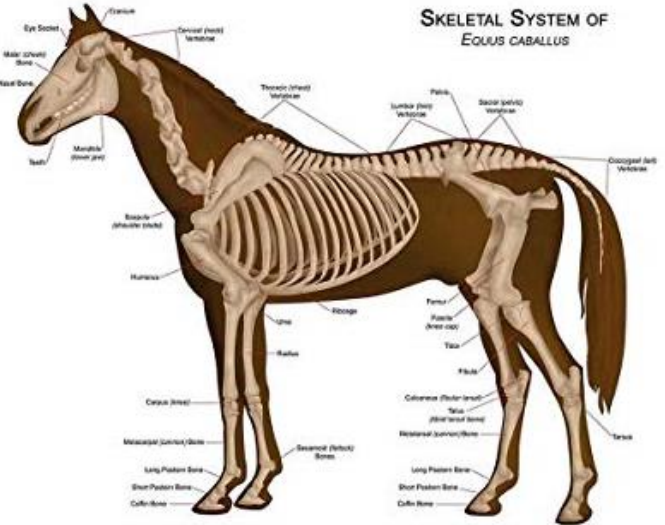
SKELETON THORACIS

RIBS (COSTAE):

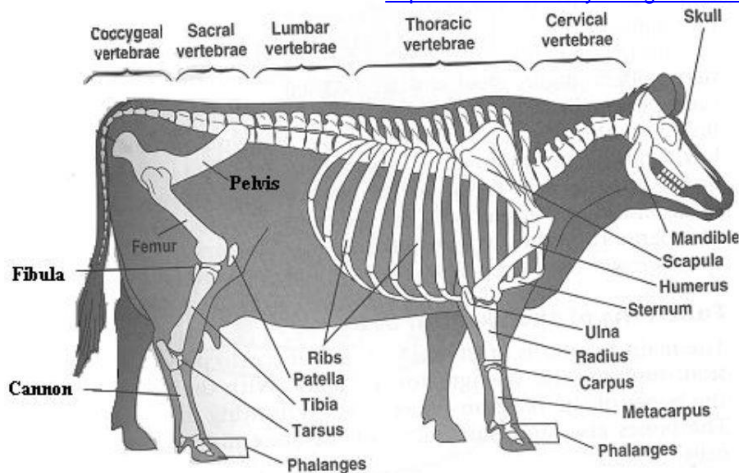
- the number of the ribs corresponds to the number of the thoracic vertebrae
- a. in carnivores, ruminants 13
- b. in pigs 14 – 15
- c. in horses 18



<https://canineanatomyforbeginners.wordpress.com/skeletal-system/>



<https://www.amazon.co.jp/ANIMALS-SKELETON-ANATOMY-POSTER-%E5%8B%95%E7%89%A9%E3%81%86%E3%81%BE%E3%82%A2%E3%83%BC%E3%83%88%E3%83%97%E3%83%AA%E3%83%B3%E3%83%88%E3%83%9D%E3%82%B9%E3%82%BF%E3%83%BC/dp/B01MT1FNZR>



<https://hu.pinterest.com/pin/122160208625934287/>

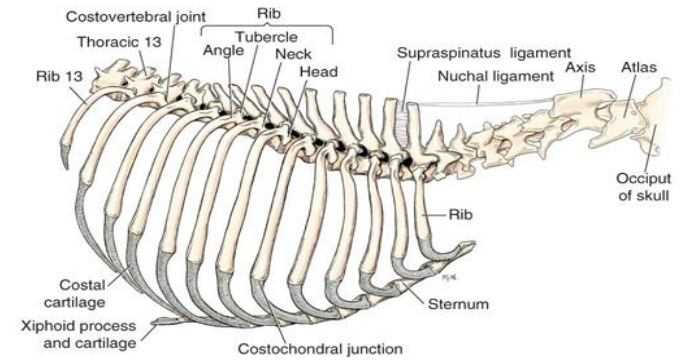
SKELETON THORACIS

RIBS (COSTAE):

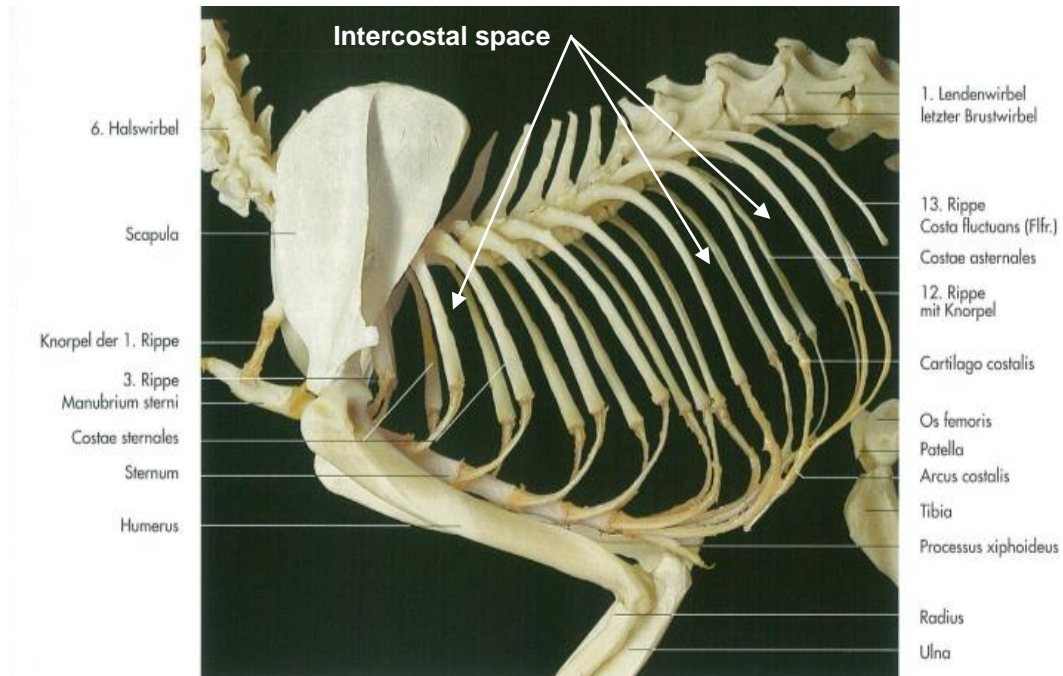
- forms the lateral wall of the thorax

INTERCOSTAL SPACES (SPATIA INTERCOSTALIA)

- spaces between the ribs



<https://veteriankey.com/canine-anatomy/>



Skeleton of the thorax, Fe, lateral aspect

SKELETON THORACIS

EACH RIB is divided into:

1. a bony portion – OS COSTALE

- situated proximally

2. a cartilaginous portion – CARTILAGO COSTALIS

- situated dorsally

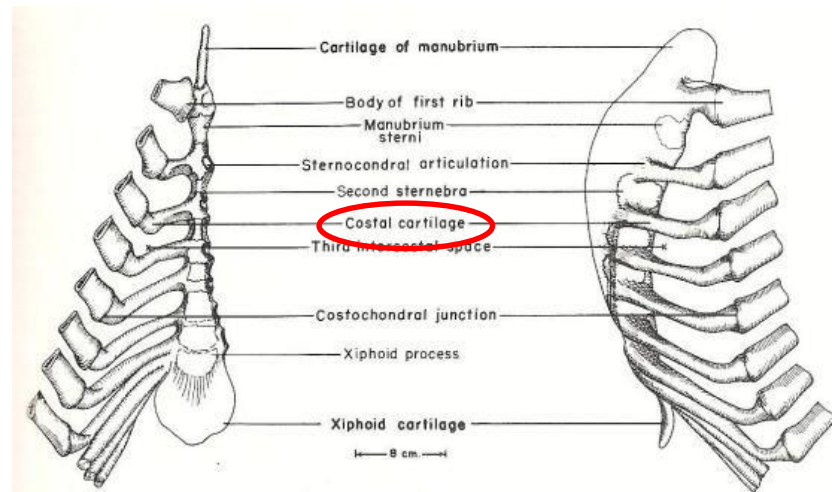


FIGURE 15-21. Sternum and costal cartilages of horse. Dorsal view on left; lateral view on right.

<https://www.rodnikkel.com/content/saddle-tree-blog-from-shop-and-desk/the-rib-cage/>



Skeleton of the thorax, Fe, lateral aspect

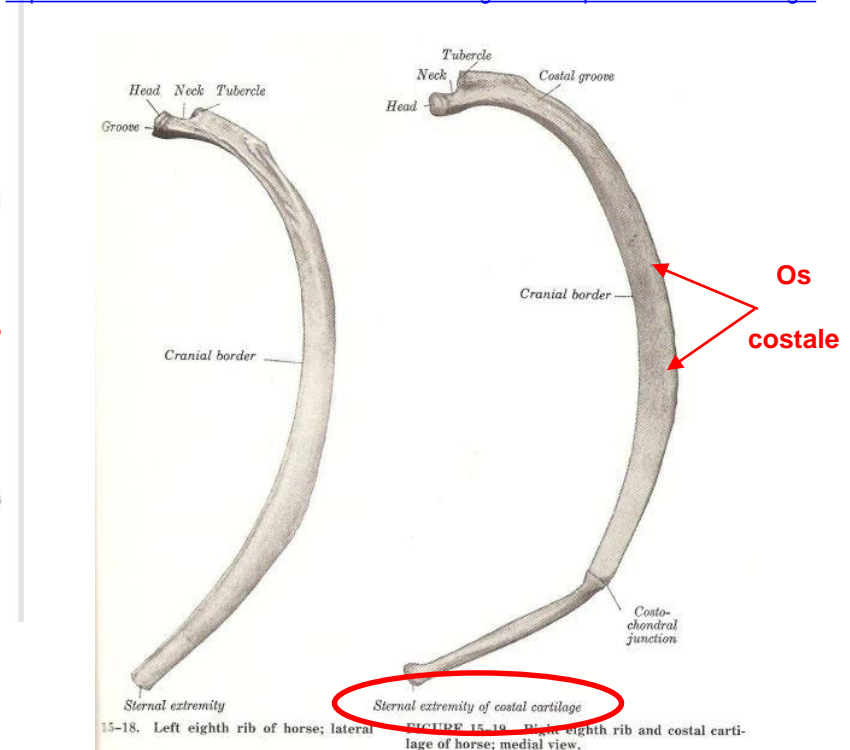


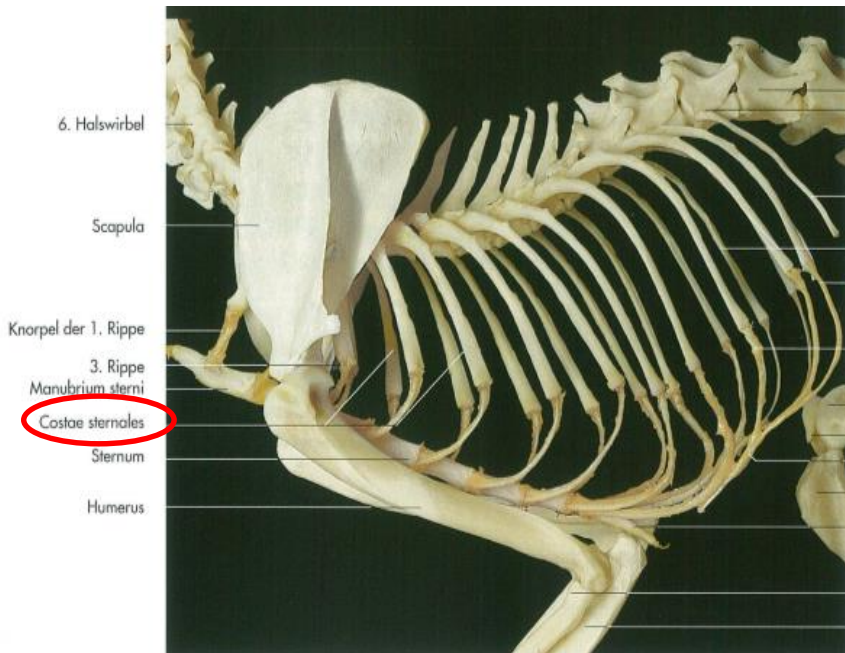
FIGURE 15-19. Eighth rib and costal cartilage of horse; medial view.

<https://www.rodnikkel.com/content/saddle-tree-blog-from-shop-and-desk/the-rib-cage/>

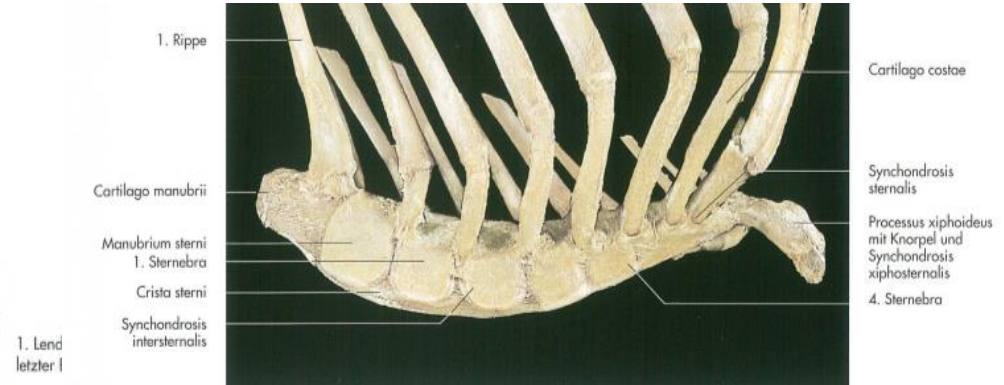
SKELETON THORACIS

COSTAE VERAЕ seu STERNALES (true, direct ribs):

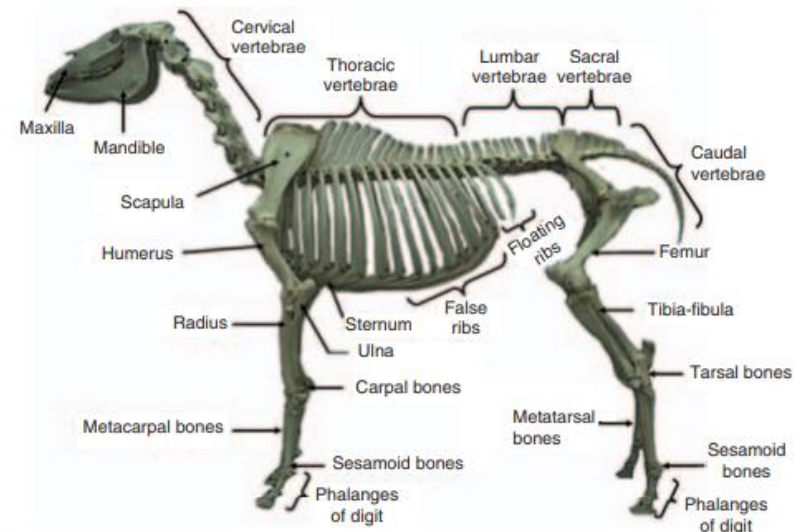
- the cranial ribs conjoined directly by their cartilages with the sternum
- called as „bearing ribs” - suspend the trunk



Skeleton of the thorax, Fe, lateral aspect



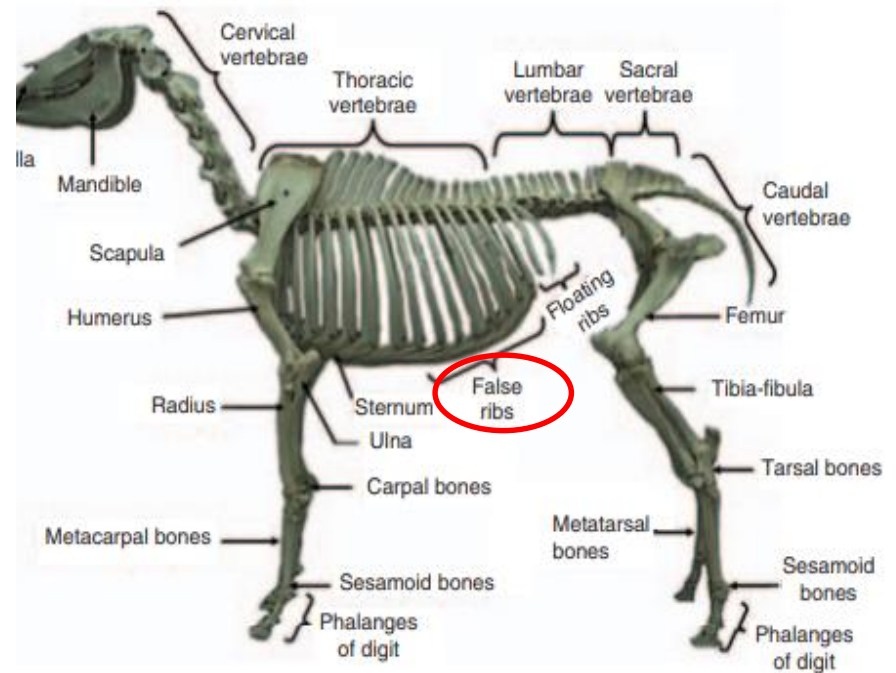
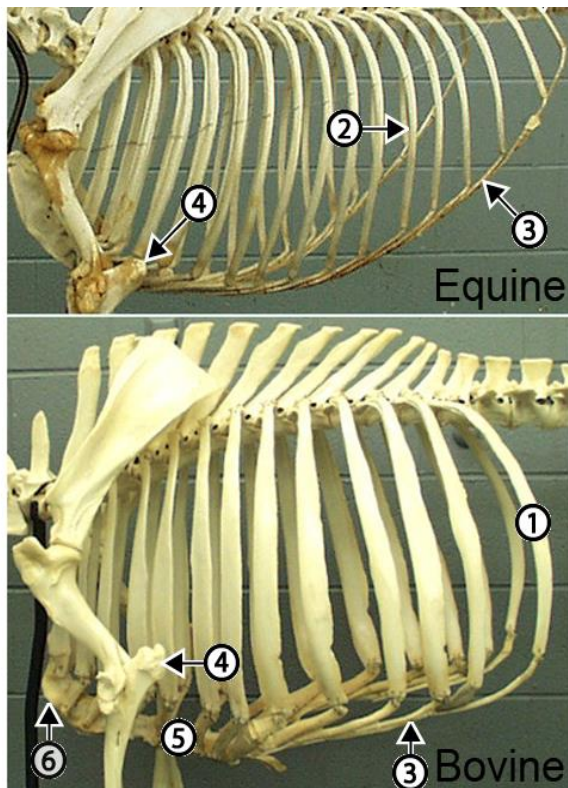
Sternum, Eq., lateral aspect



SKELETON THORACIS

COSTAE SPURIAE seu ASTERNALES (false, asternal, indirect ribs):

- the remainder ribs do not form a direct junction with the sternum
- called as „respiratory ribs”- highly mobile allowing the free movement of the thorax during respiration



<https://pdfs.semanticscholar.org/dbbc/1f29438b5cabd11c6b37d6fd410d6480d547.pdf>

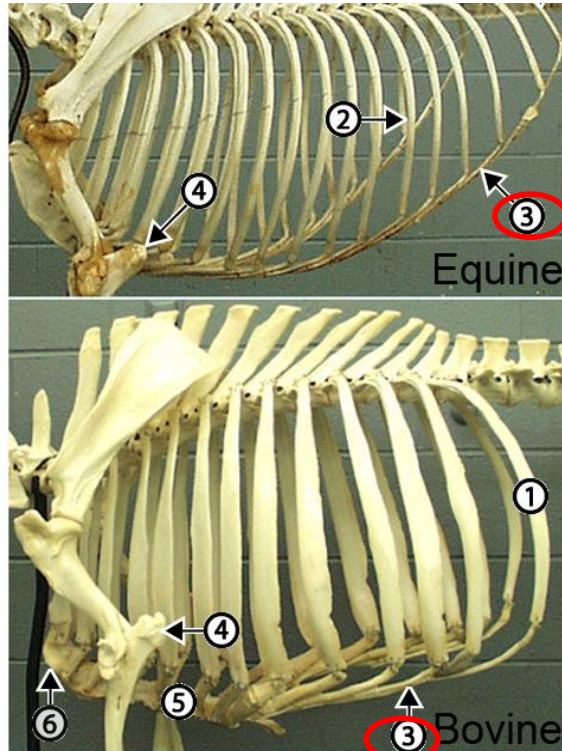
Comparative thoracic osteology. The horse has more ribs but they are thinner. The last rib (1) is shorter in the horse but the 13th rib of the horse (2) is similar in length to the bovine 13th rib (1). The costal arch (3) is much longer and more slanted in the horse. The bovine thorax is deeper than that of the horse and therefore the bovine sternum (5) is ventral to the olecranon (4). The cranial part of the bovine sternum forms the brisket (6).

<http://vanat.cvm.umn.edu/ungDissect/Lab09/lmg9-1.html>

SKELETON THORACIS

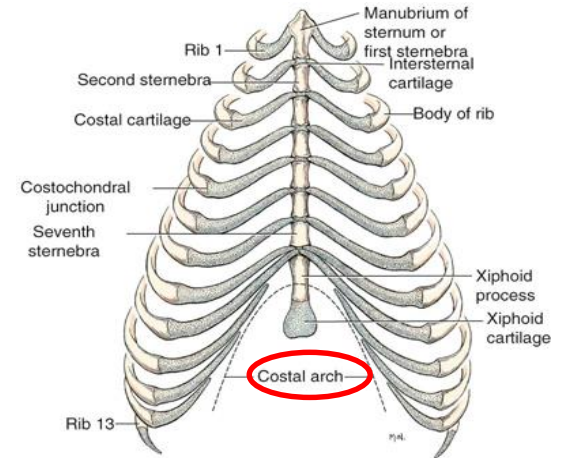
COSTAE SPURIAE seu ASTERNALES (false, asternal, indirect ribs):

- their cartilages unite with one another to form the **COSTAL ARCH (ARCUS COSTALIS)**



Comparative thoracic osteology. The horse has more ribs but they are thinner. The last rib is shorter in the horse but the 13th rib of the horse (2) is similar in length to the bovine. The costal arch (3) is much longer and more slanted in the horse. The bovine thorax is that of the horse and therefore the bovine sternum (5) is ventral to the olecranon (4). The part of the bovine sternum forms the brisket (6).

<http://vanat.cvm.umn.edu/ungDissect/Lab09/Img9-1.html>

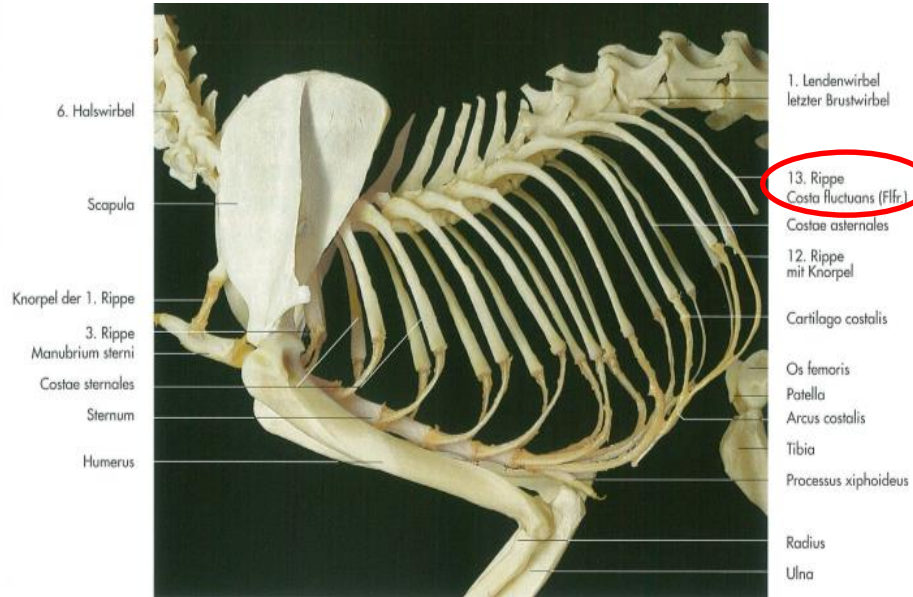


Skeleton of the thorax, Fe, lateral aspect

SKELETON THORACIS

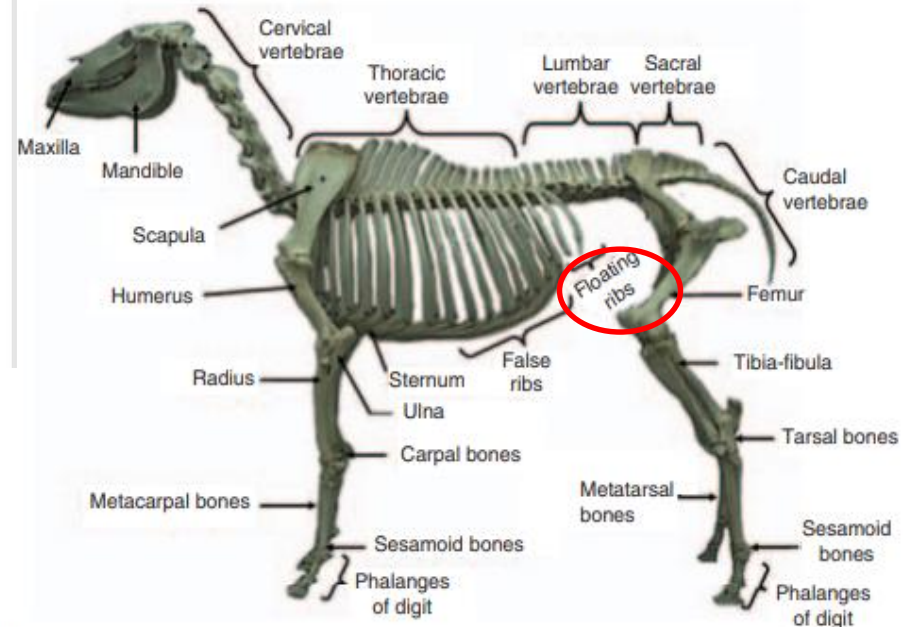
COSTAE FLUCTUANTES (floating ribs):

- ribs their ends are free
- the free ends do not attached to the adjacent cartilage
- the last pair of ribs in dog



Skeleton of the thorax, Fe, lateral aspect

<https://www.rodnikkel.com/content/index.php/saddle-tree-blog-from-shop-and-desk/thoracic-spine-anatomy-movement-and-saddle-fit/>



<https://pdfs.semanticscholar.org/dbbc/1f29438b5cabd11c6b37d6fd410d6480d547.pdf>

SKELETON THORACIS

PARTS OF THE BONY PORTION OF THE RIBS (OS COSTALE):

I. ON THE EXTREMITAS VERTEBRALIS (VERTEBRAL EXTREMITY):

1. HEAD (CAPUT COSTAE)

a. SULCUS seu CRISTAE CAPITIS COSTAE

b. FACIES ARTICULARIS CAPITIS COSTAE CRANIALIS

c. FACIES ARTICULARIS CAPITIS COSTAE CAUDALIS

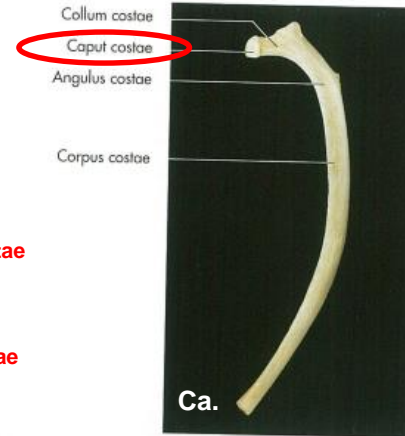
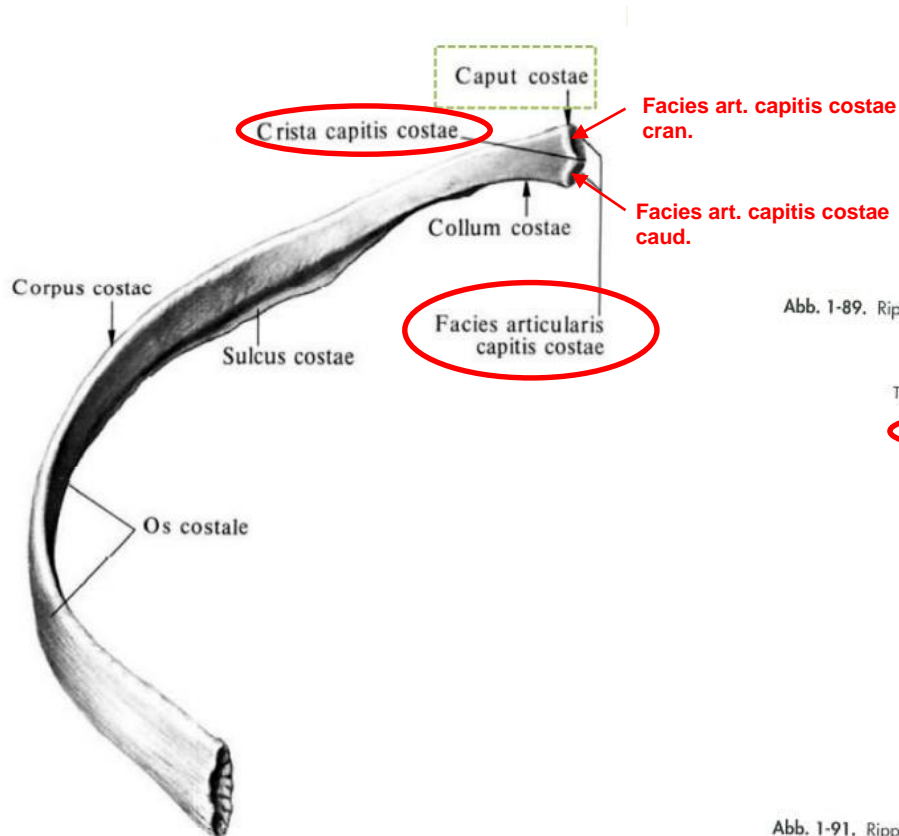


Abb. 1-89. Rippe eines Hundes (Kaudalansicht).

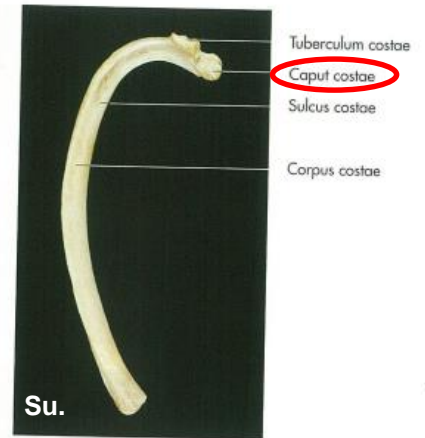


Abb. 1-90. Rippe eines Schweines (Kaudalansicht).

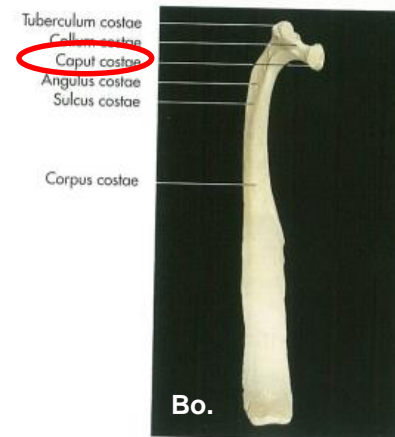


Abb. 1-91. Rippe eines Rindes (Kaudalansicht).



Abb. 1-92. Rippe eines Pferdes (Kaudalansicht).

SKELETON THORACIS

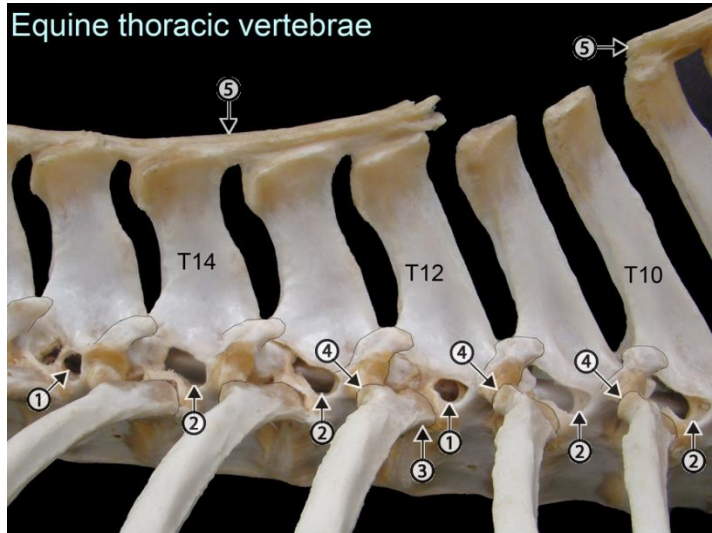
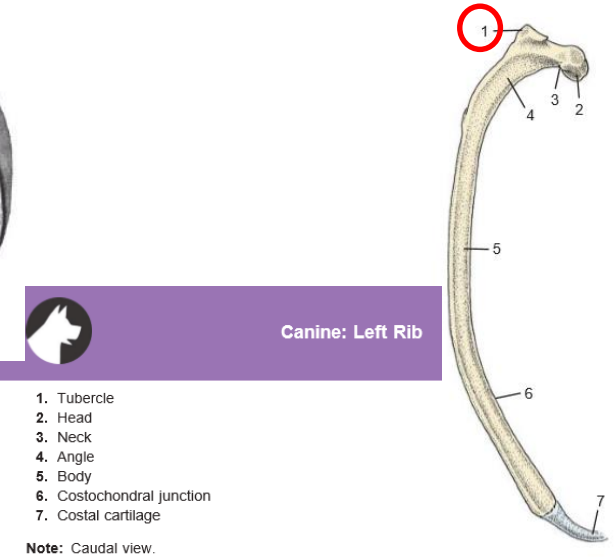
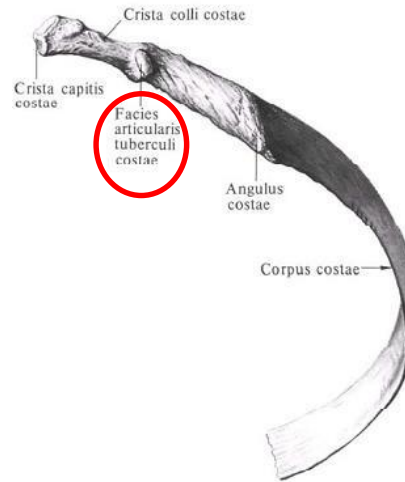
PARTS OF THE BONY PORTION (OS COSTALE):

2. COLLUM COSTAE

- lies distally

3. TUBERCULUM COSTAE

- protrudes laterally
- - FACIES ARTICULARIS TUBERCULI COSTAE



A comparison of lateral vertebral foramina (1) and intervertebral foramina (2). 3, head of a rib; 4, tubercle of a rib; 5, supraspinous ligament.



Tuberculum costae

Caput costae
Sulcus costae

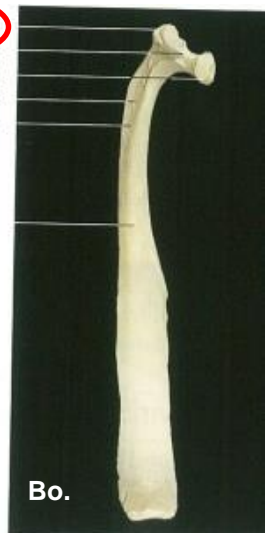
Corpus costae

Su.

Tuberculum costae

Collum costae
Caput costae
Angulus costae
Sulcus costae

Corpus costae



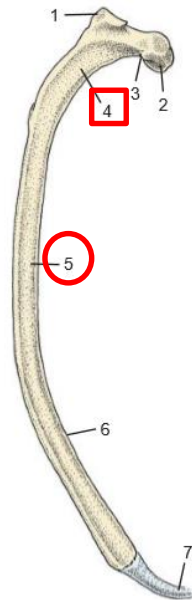
Bo.

SKELETON THORACIS

PARTS OF THE BONY PORTION (OS COSTALE):

4. ANGULUS COSTAE (ANGLE):

- distal to the costal tubercle
- intervening portion of the CORPUS COSTAE



Canine: Left Rib

1. Tubercle
2. Head
3. Neck
4. Angle
5. Body
6. Costochondral junction
7. Costal cartilage

Note: Caudal view.

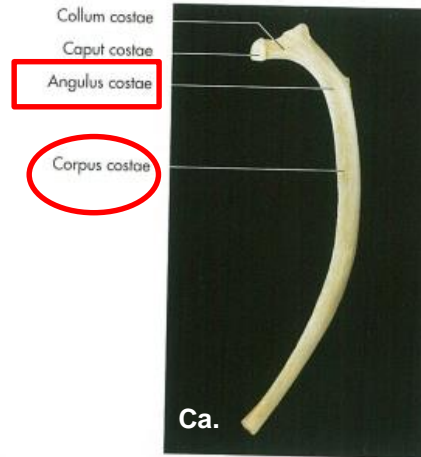


Abb. 1-89. Rippe eines Hundes (Kaudalansicht).

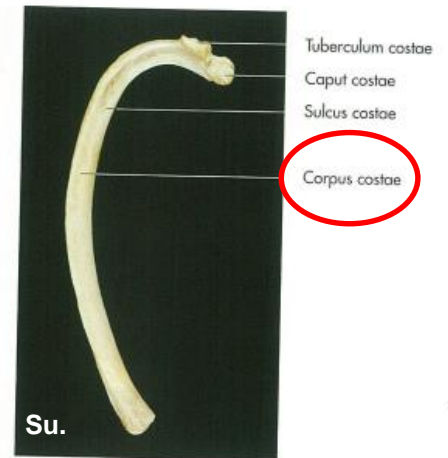


Abb. 1-90. Rippe eines Schweines (Kaudalansicht).



Abb. 1-91. Rippe eines Rindes (Kaudalansicht).

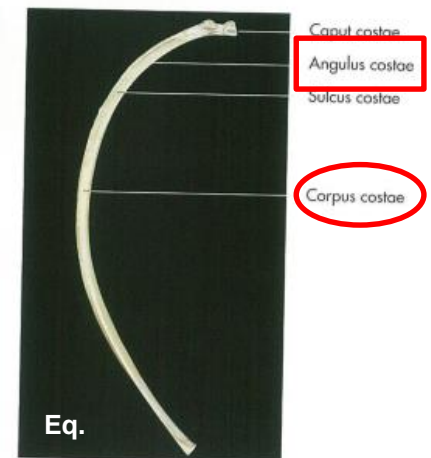


Abb. 1-92. Rippe eines Pferdes (Kaudalansicht).

SKELETON THORACIS

PARTS OF THE BONY PORTION (OS COSTALE):

5. TUBEROSITAS MUSCULI SCALENI VENTRALIS:

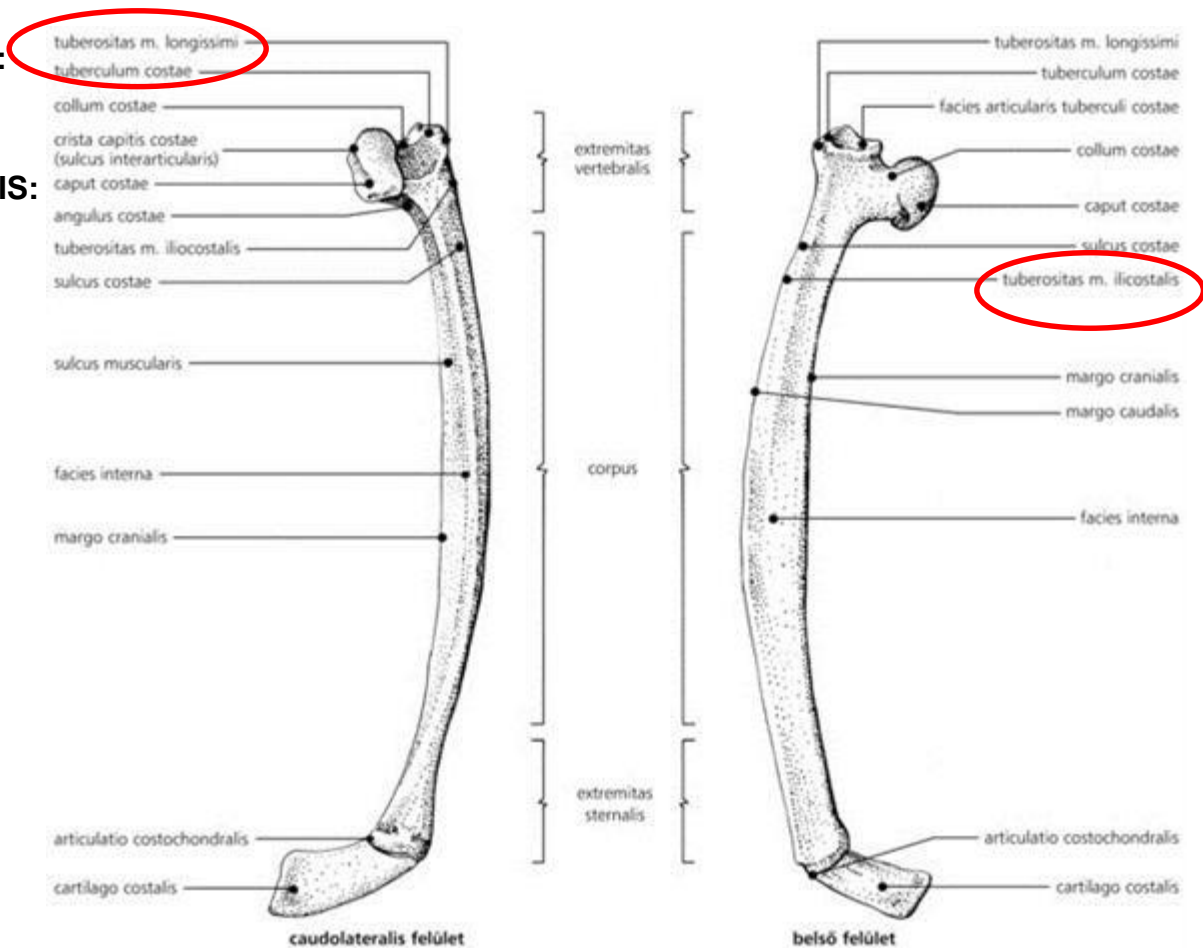
- on the 1st rib
- except ruminants

6. TUBEROSITAS MUSCULI LONGISSIMI:

- located at the level of the angle

7. TUBEROSITAS MUSCULI ILIOCOSTALIS:

- on the caudolateral border



SKELETON THORACIS

PARTS OF THE BONY PORTION (OS COSTALE):

8. SULCUS COSTAE:

- on the medial surface
- intercostal vessels and nerves

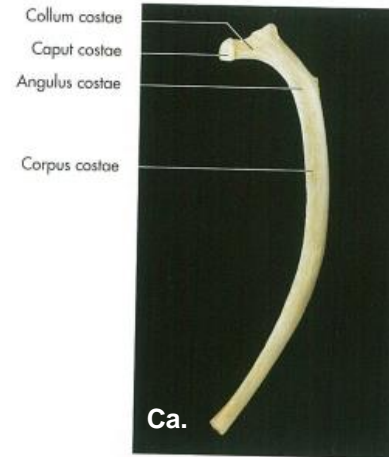
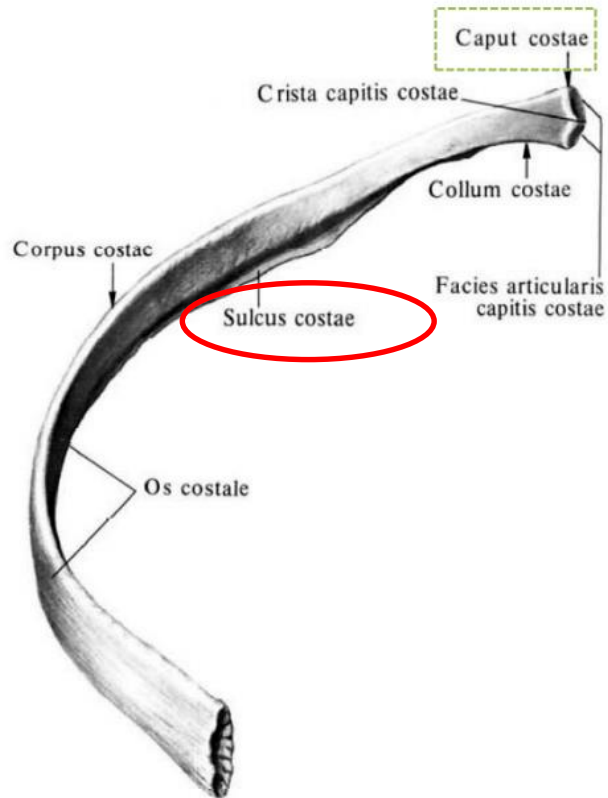


Abb. 1-89. Rippe eines Hundes (Kaudalansicht).

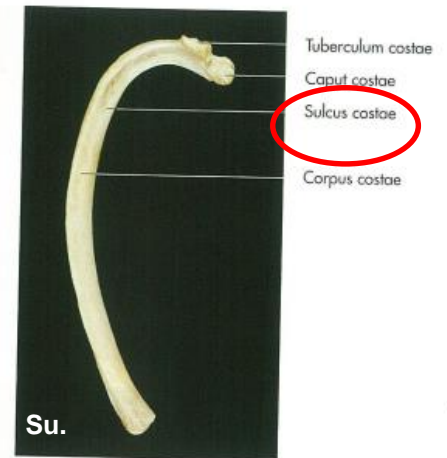


Abb. 1-90. Rippe eines Schweines (Kaudalansicht).

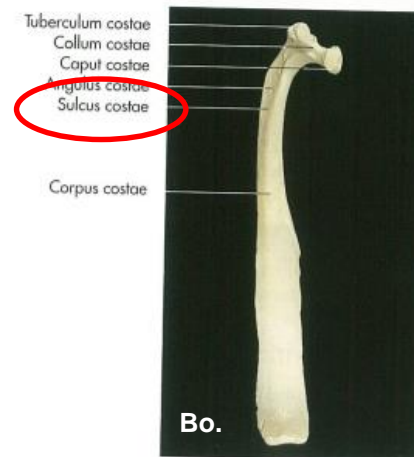


Abb. 1-91. Rippe eines Rindes (Kaudalansicht).

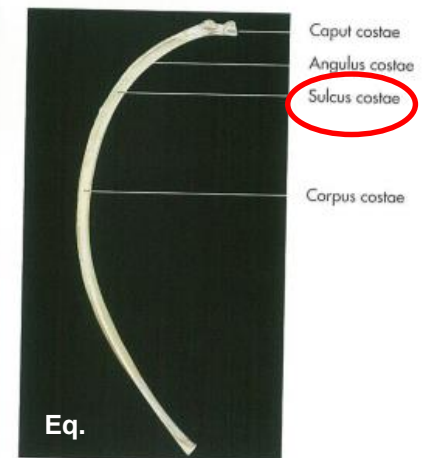


Abb. 1-92. Rippe eines Pferdes (Kaudalansicht).

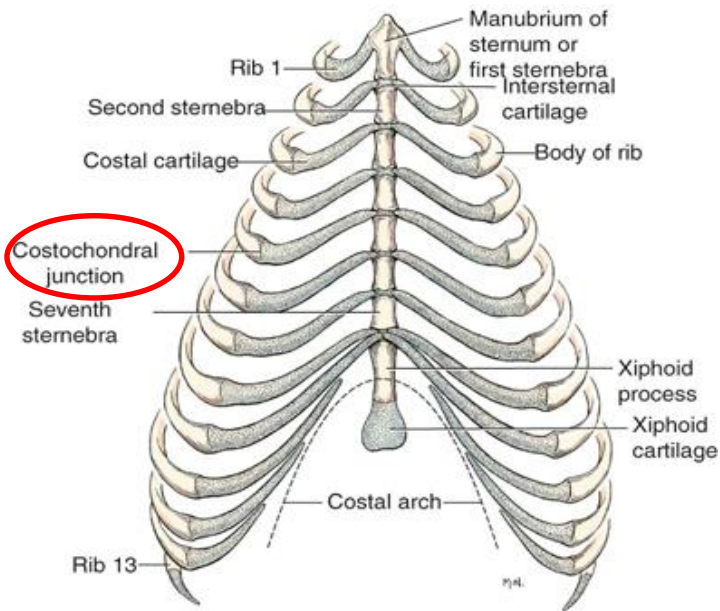
SKELETON THORACIS

PARTS OF THE BONY PORTION (OS COSTALE):

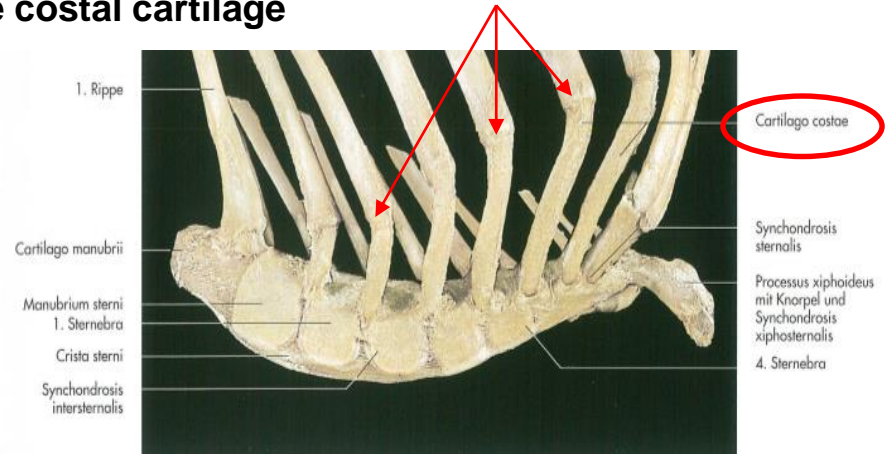
II. ON THE EXTREMITAS STERNALIS (STERNAL EXTREMITY):

a. COSTOCHONDRAL JUNCTION

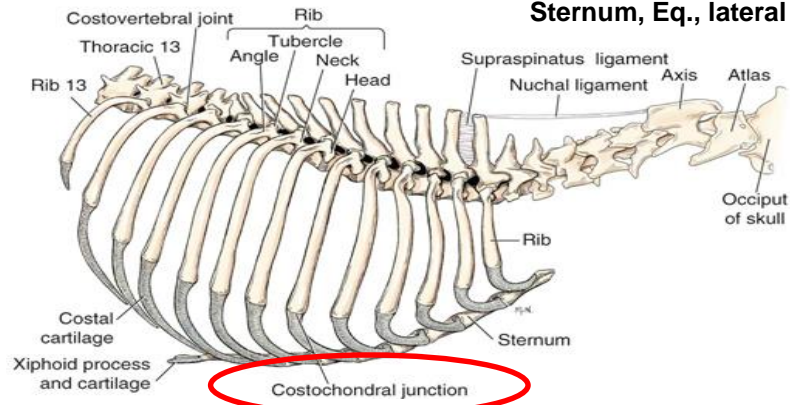
- between the distal part of the bony portion and the costal cartilage



<https://veteriankey.com/canine-anatomy/>



Sternum, Eq., lateral aspect



<https://veteriankey.com/canine-anatomy/>

SKELETON THORACIS

PARTS OF THE BONY PORTION (OS COSTALE):

II. ON THE EXTREMITAS STERNALIS (STERNAL EXTREMITY):

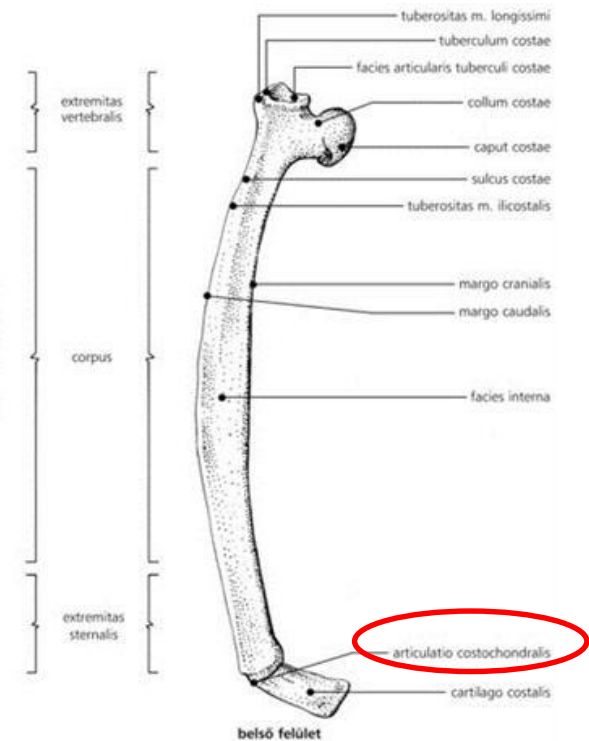
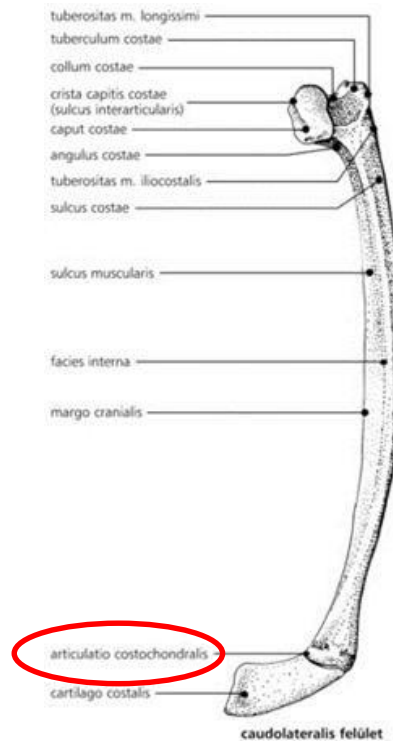
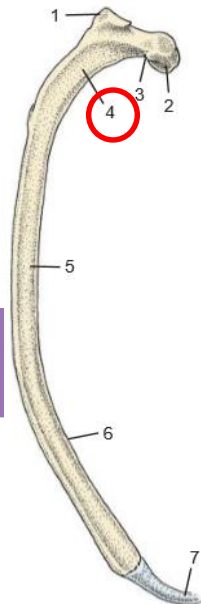
1. GENU COSTAE (KNEE):

- the angulation of the rib with the costal cartilage
- in the dog formed by the costal cartilage
- in other animals accures at the costochondral junction



1. Tubercle
2. Head
3. Neck
4. Angle
5. Body
6. Costochondral junction
7. Costal cartilage

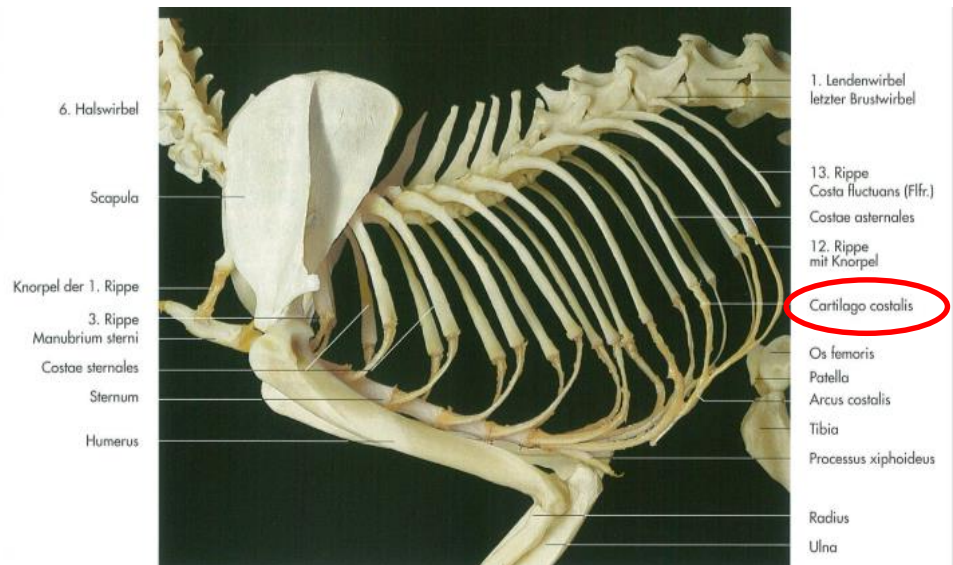
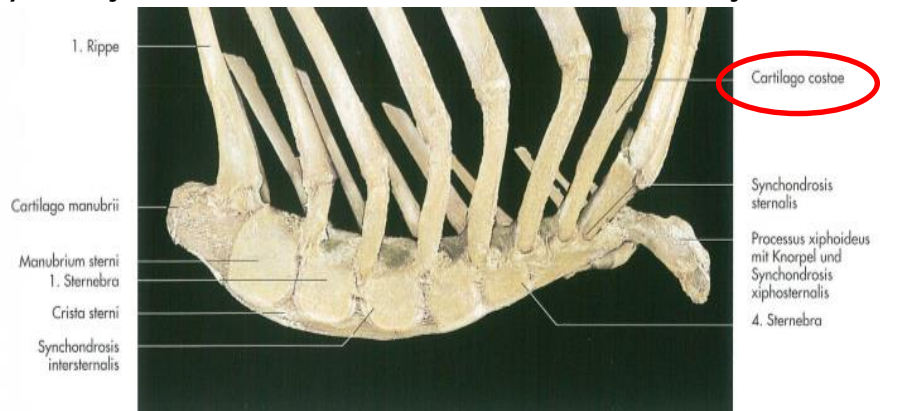
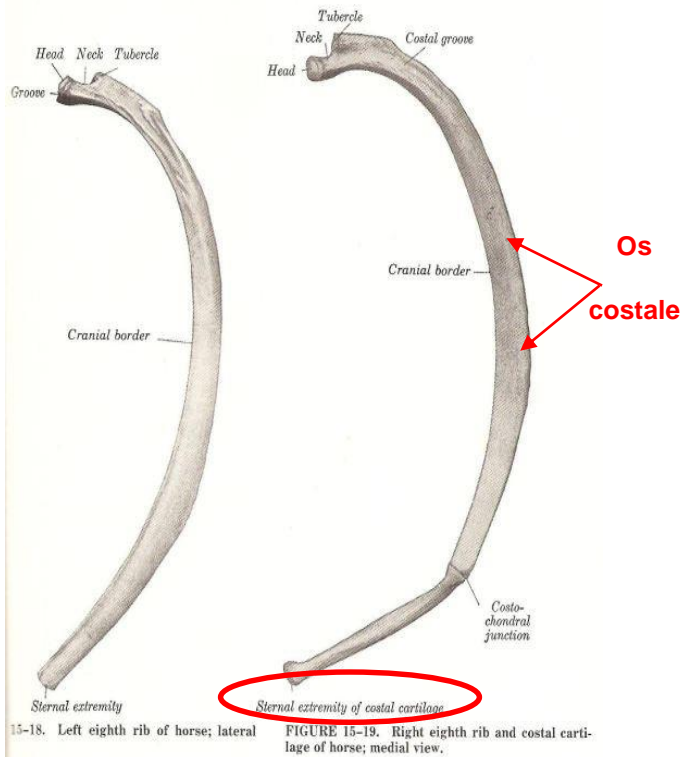
Note: Caudal view.



SKELETON THORACIS

COSTAL CARTILAGE (CARTILAGO COSTALIS):

- articulates with the sternum
- a) the 1st pair of ribs articulate with the manubrium sterni
- b) the subsequent sternal ribs (except for the last pair) from joints – which are situated between the adjacent sternal segments



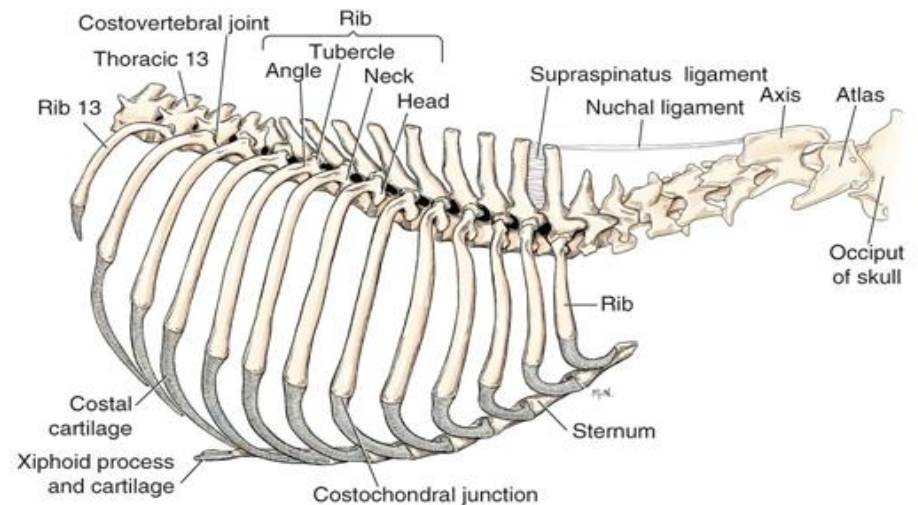
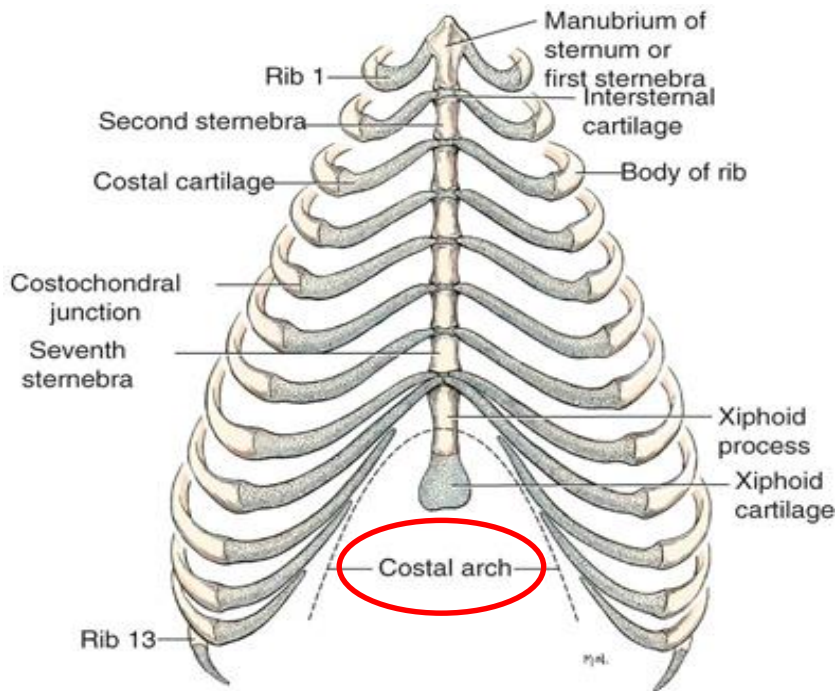
SKELETON THORACIS

COSTAL CARTILAGE (CARTILAGO COSTALIS):

c. cartilages of the asternal ribs longer – form the costal arch

ANGULUS ARCUUM COSTALIUM:

- formed by both costal arches ventrally
- inserted into the xiphoid process



<https://veteriankey.com/canine-anatomy/>

<https://veteriankey.com/canine-anatomy/>

THANK YOU FOR YOUR ATTENTION!



BIBLIOGRAPHIE

1. R. Nickel, A. Shummer, E. Steiferle: Lehrbuch der Anatomie der Haustiere Band III., 2. Auflage
2. Klaus-Dieter Budras, Patrick H. McCarthy , Wolfgang Fricke : Renate Richter Anatomy of the Dog, 5th revised Edition
3. Klaus-Dieter Budras , W.O.Sack, Sabine Röck : Anatomy of the Horse 5th revised Edition
4. Klaus – Dieter Budras, Rober E. Habel: Bovine Anatomy, 1st Edition
5. Miller’s Anatomy of the dog, 4th Edition
6. König – Liebich: Anatomie der Haussäugetiere, 4. Auflage
7. König – Liebich: Veterinary Anatomy of Domestic Mammals, 4th Edition
8. Saunders W.B: Veterinary Anatomy Flash Cards, 2nd Revised edition