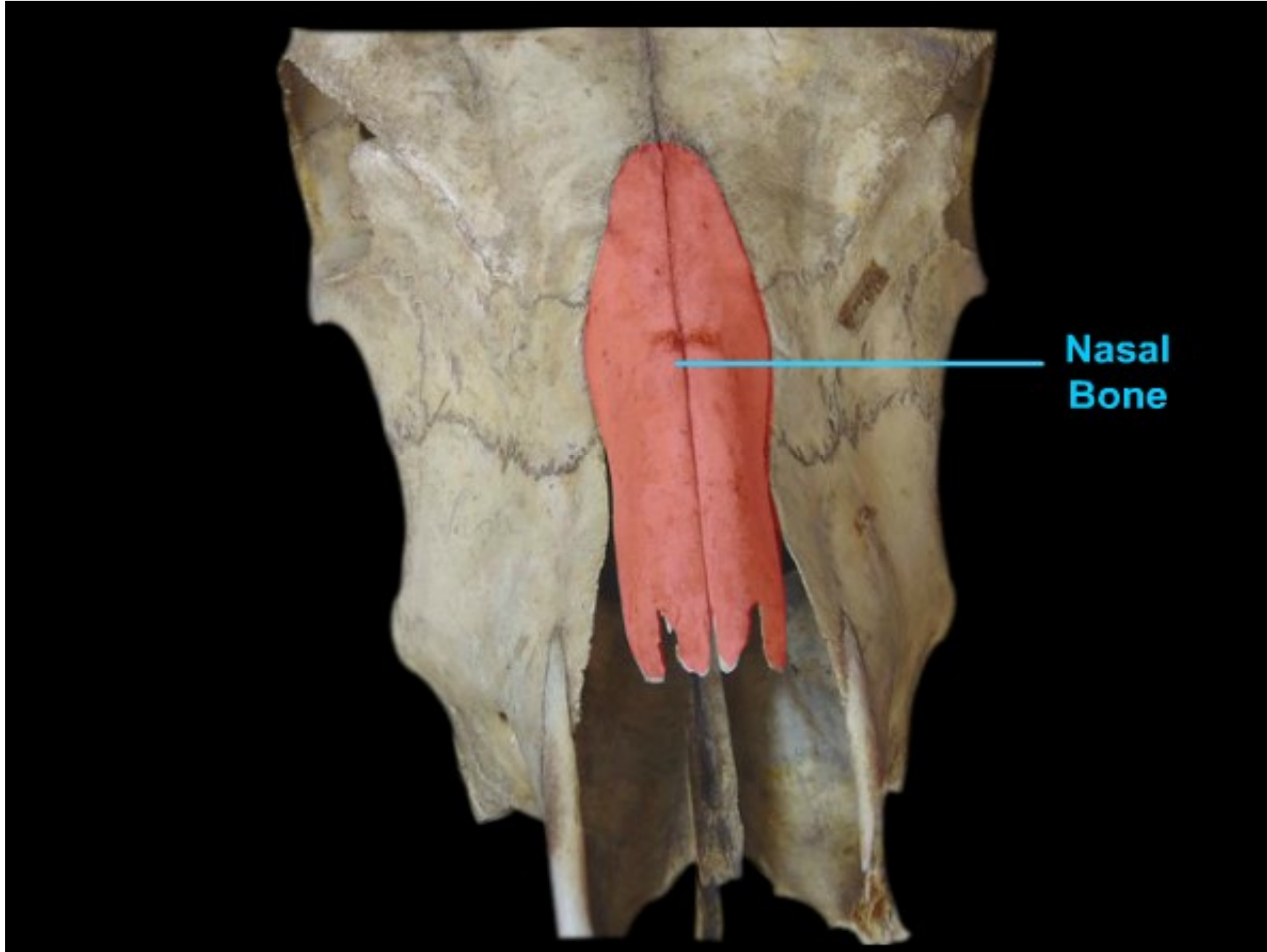


FACIAL BONES

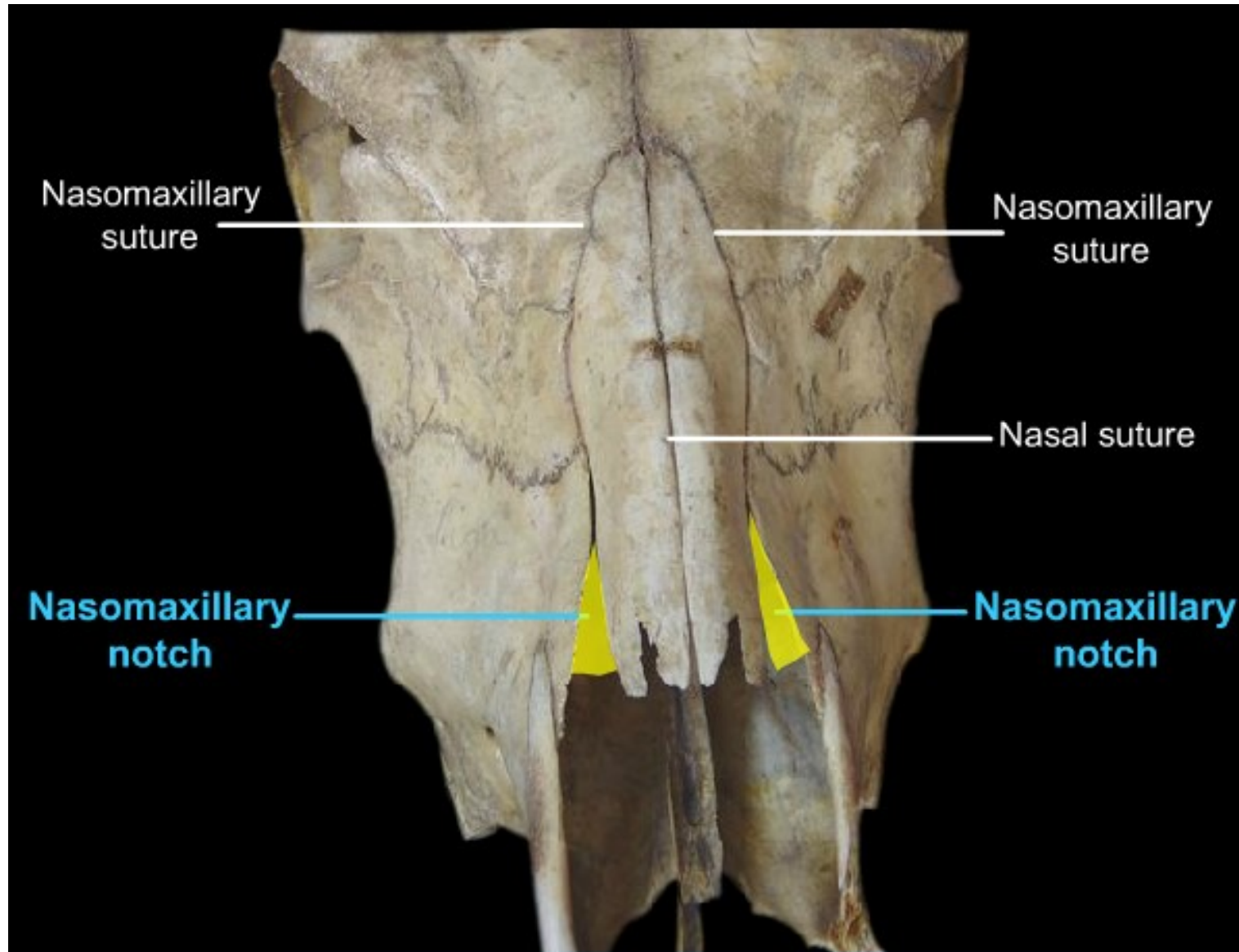
S. no.	Facial bones	
1	Lacrimal	Paired
2	Malar	Paired
3	Maxilla	Paired
4	Pre-maxilla	Paired
5	Palatine	Paired
6	Nasal	Paired
7	Pterygoid	Paired
8	Turbinates	Paired
9	Vomer	Single
10	Mandible	Single
11	Hyoid	

- **Nasal bone in Ox**
- They are elongated curved plates situated in front of the frontals and form the greater part of the roof of the nasal cavity.
- They do not fuse laterally with adjacent bones even in old age.
- The dorsal facial surface is convex.
- The ventral nasal face is concave.
- Its medial half forms the dorsal meatus and immediately below it, is the dorsal turbinate crest for the attachment of the dorsal turbinate bone.
- The extreme posterior part is excavated to a small extent in old animals.
- The lateral border is free and forms the naso-maxillary notch with the premaxilla.

Nasal bones



Nasal bones

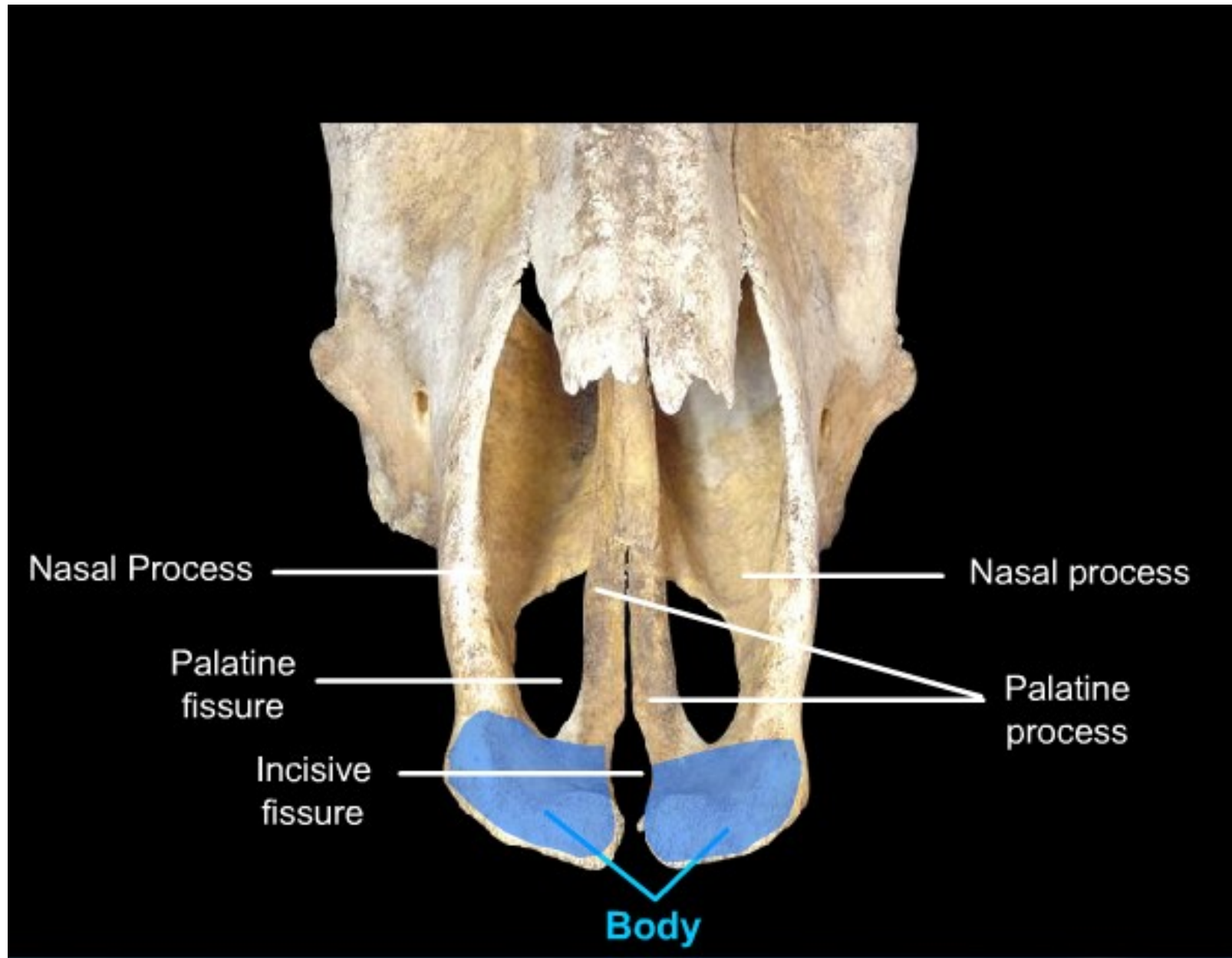


PREMAXILLA BONE

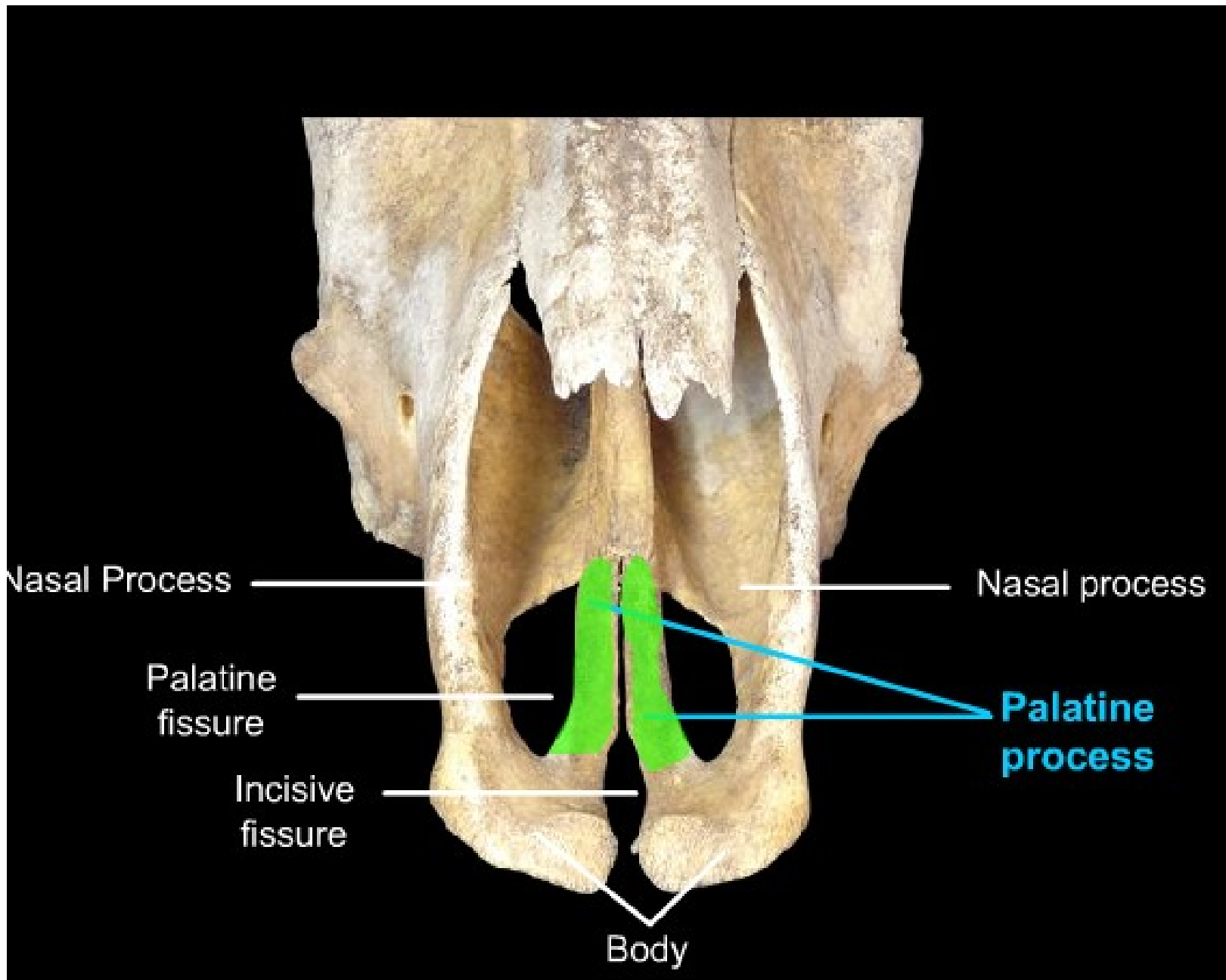
Ox

- The premaxilla forms the anterior part of the upper jaw and has a body and two process -**nasal process and palatine process**.
- The **lateral surface** of the body is convex and is related to the upper lip.
- The **buccal surface** is concave and related to the dental pad.
- The medial edge is concave and forms with its fellow the **incisive fissure**.
- The **nasal process projects upward** from the body and form the lateral wall of the nasal cavity.
- The **lateral (facial) and medial nasal surfaces** of this process are smooth. Its posterior two third fits into the groove on the anterior edge of the body of the maxilla.
- The **palatine process** is smaller than the nasal. It is a thin plate of bone, which forms the anterior part of the bony palate. Its nasal surface slopes medially and with its fellow forms a groove for the **vomer and septum nasi**.
- The lateral border of the palatine process is separated from the nasal process and the maxilla by a large oval opening, the palatine fissure.

Premaxilla



Premaxilla

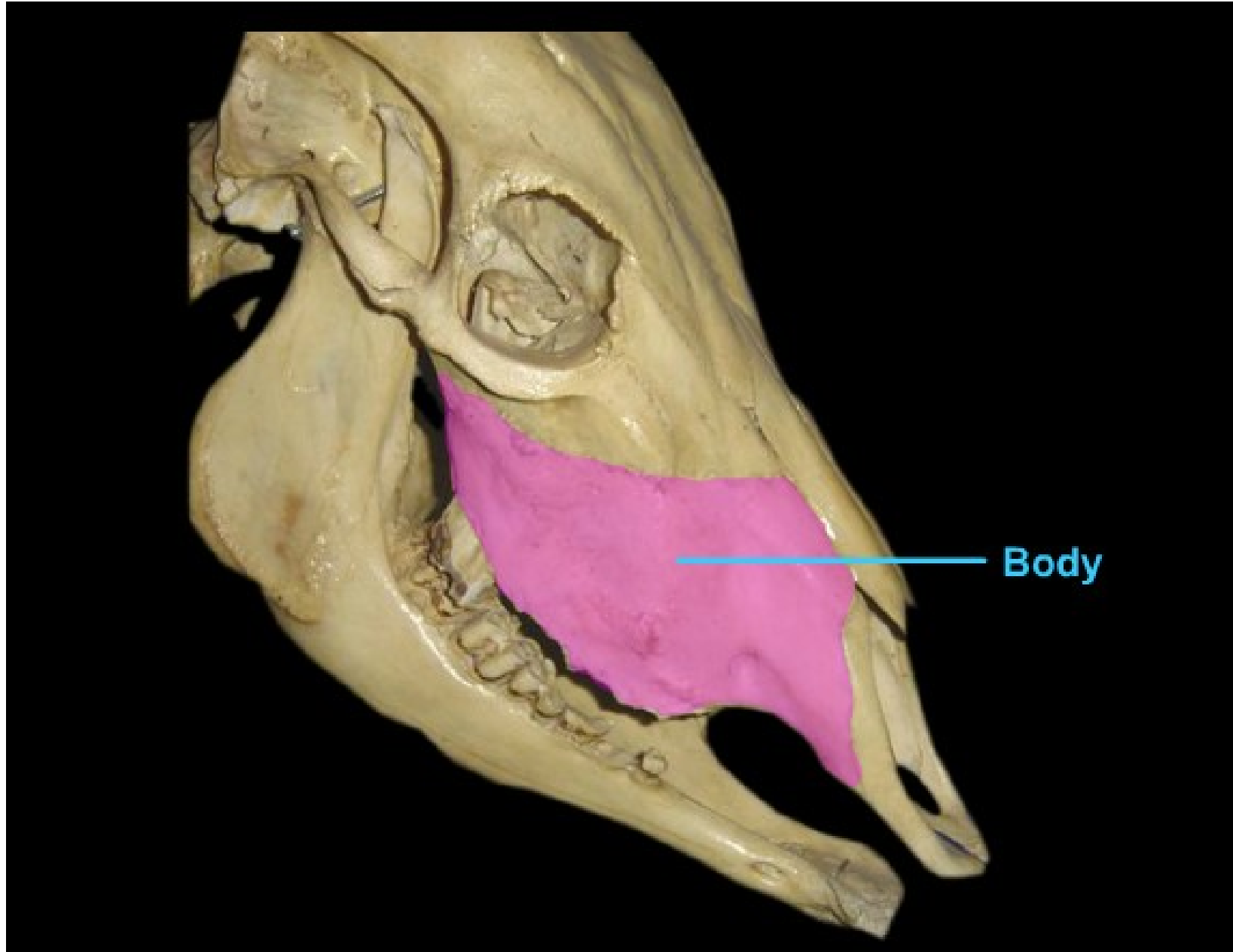


MAXILLA BONE

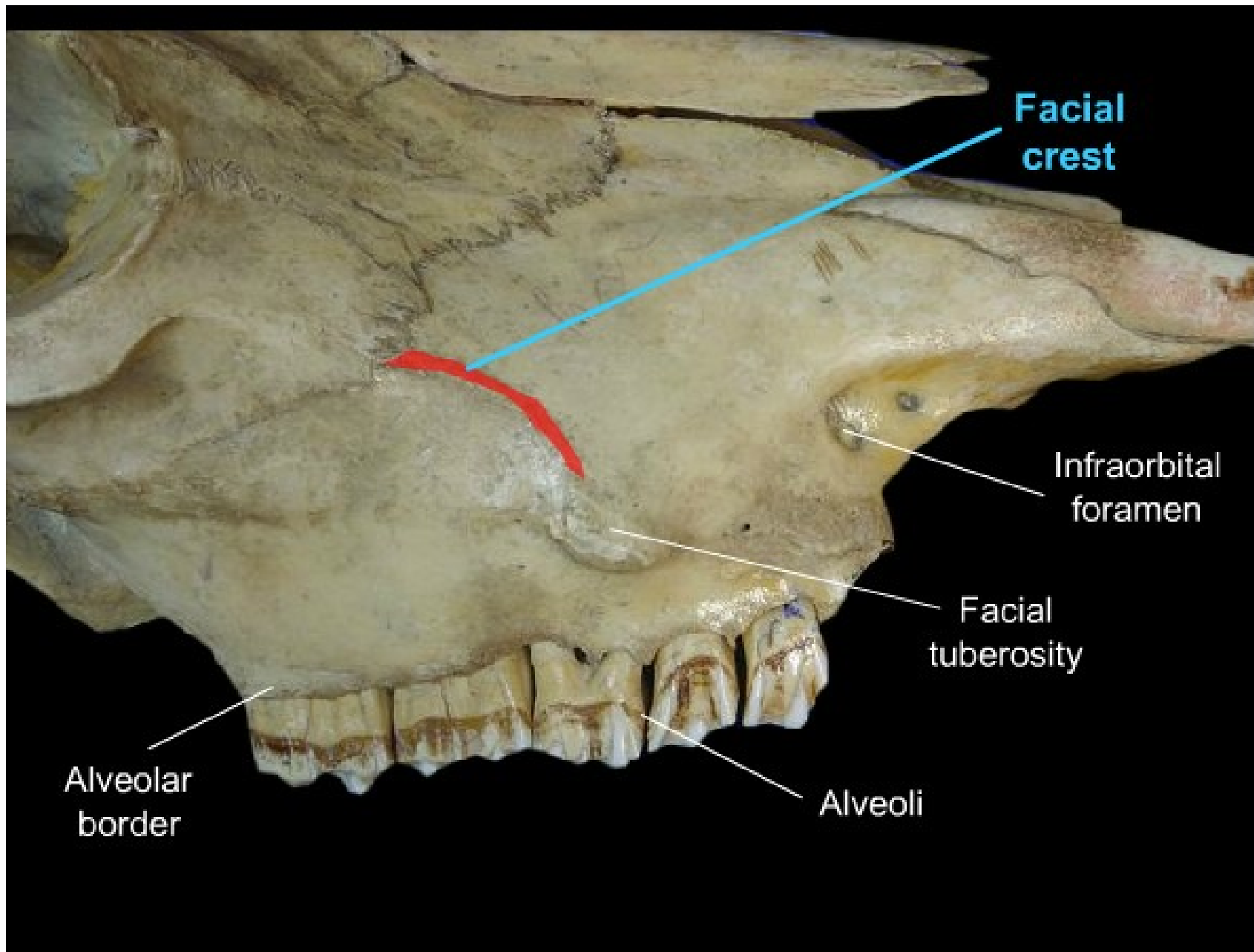
- **Ox**
- Maxilla is the **largest bone** of the upper jaw and carries the upper cheek tooth. It is situated on the lateral aspect of the face. It is made up of a **body** and two processes-the **palatine and zygomatic**.
- The external surface of the body is convex and presents about the level of the **first cheek tooth**, the **infra orbital foramen**, the external opening of the infra orbital canal for **infra orbital artery and maxillary nerve**.
- About the level of the **third cheek tooth** is the **facial tuberosity** extending from which is the **facial crest**.
- The internal surface form the lateral walls of the nasal cavity and presents about the middle the ventral turbinate crest for the **ventral turbinate bone**.
- Immediately below this is the **lacrima groove** for the membranous naso lacrimal duct.
- The dorsal border is irregular, scaly and articulates with the **nasal process of premaxilla, nasal, lacrimal and malar bones**.

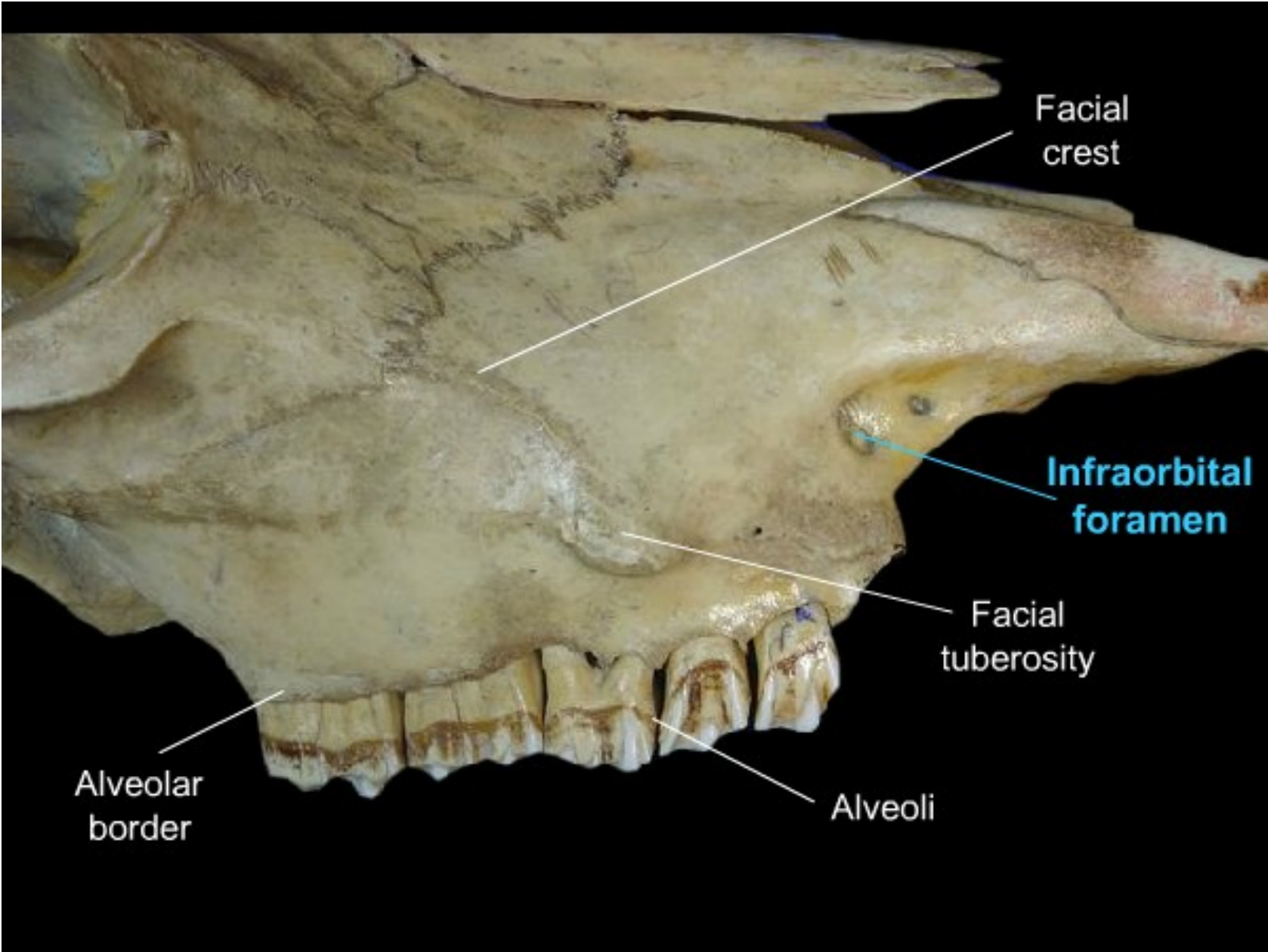
- The **ventral or alveolar border** shows **six alveoli** posterior and is free anteriorly.
- The anterior extremity is pointed and joins the premaxilla.
- Behind last alveolus is a rough mark-the **alveolar tuberosity**.
- The **maxillary tuberosity** forms posterior extremity of the bone and has the maxillary sinus prolonged into it.
- Medial to this is the **maxillary hiatus**, which presents the **spheno-palatine, maxillary and posterior palatine foramina** for nerves and vessels of the same name.
- The zygomatic process is a small projection from the posterior extremity and is overlapped by the malar.
- The palatine process forms a large part of the bony palate. Its oral surface shows the palatine groove for the greater palatine artery and nerve.
- It is excavated to form part of the **palatine sinus**.

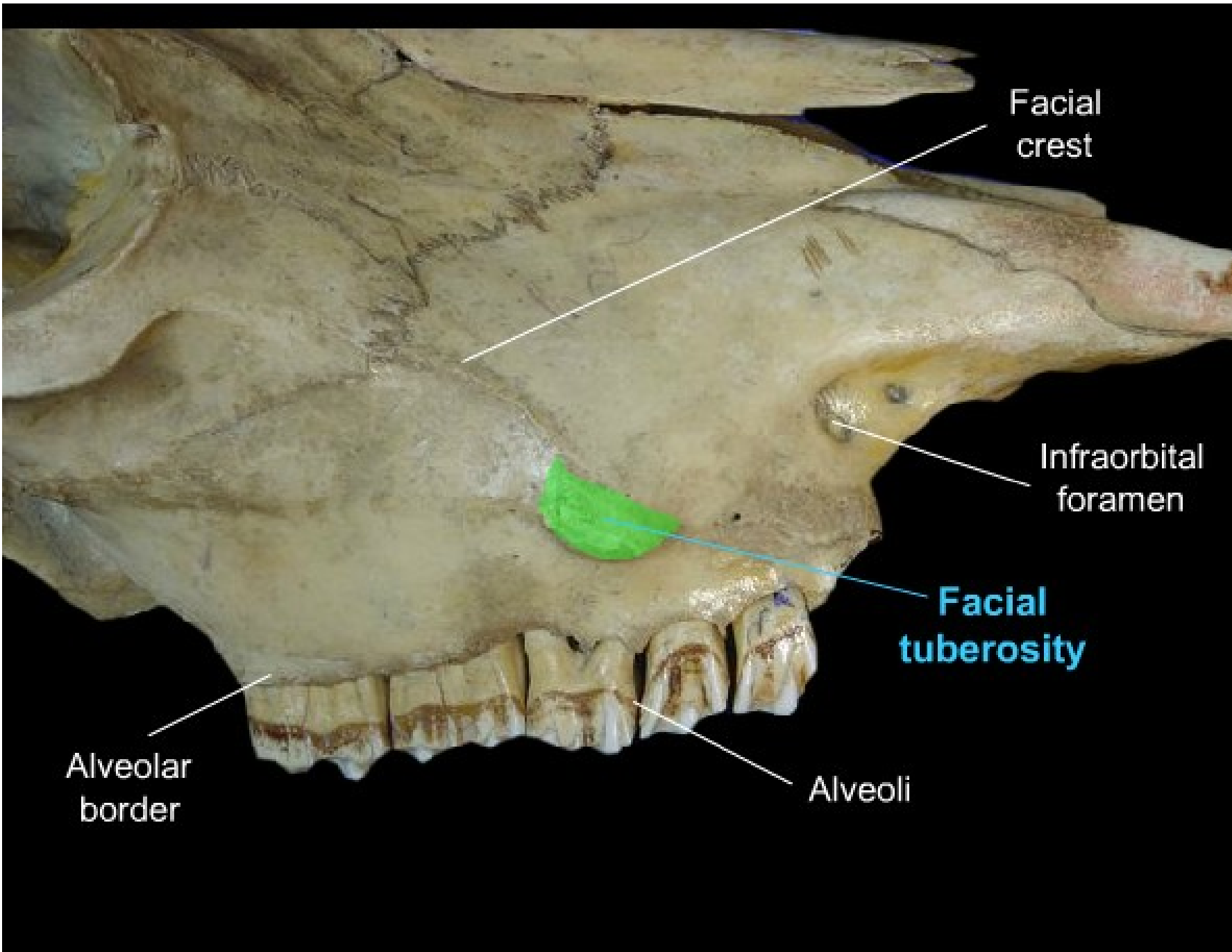
Maxilla



Maxilla







Facial crest

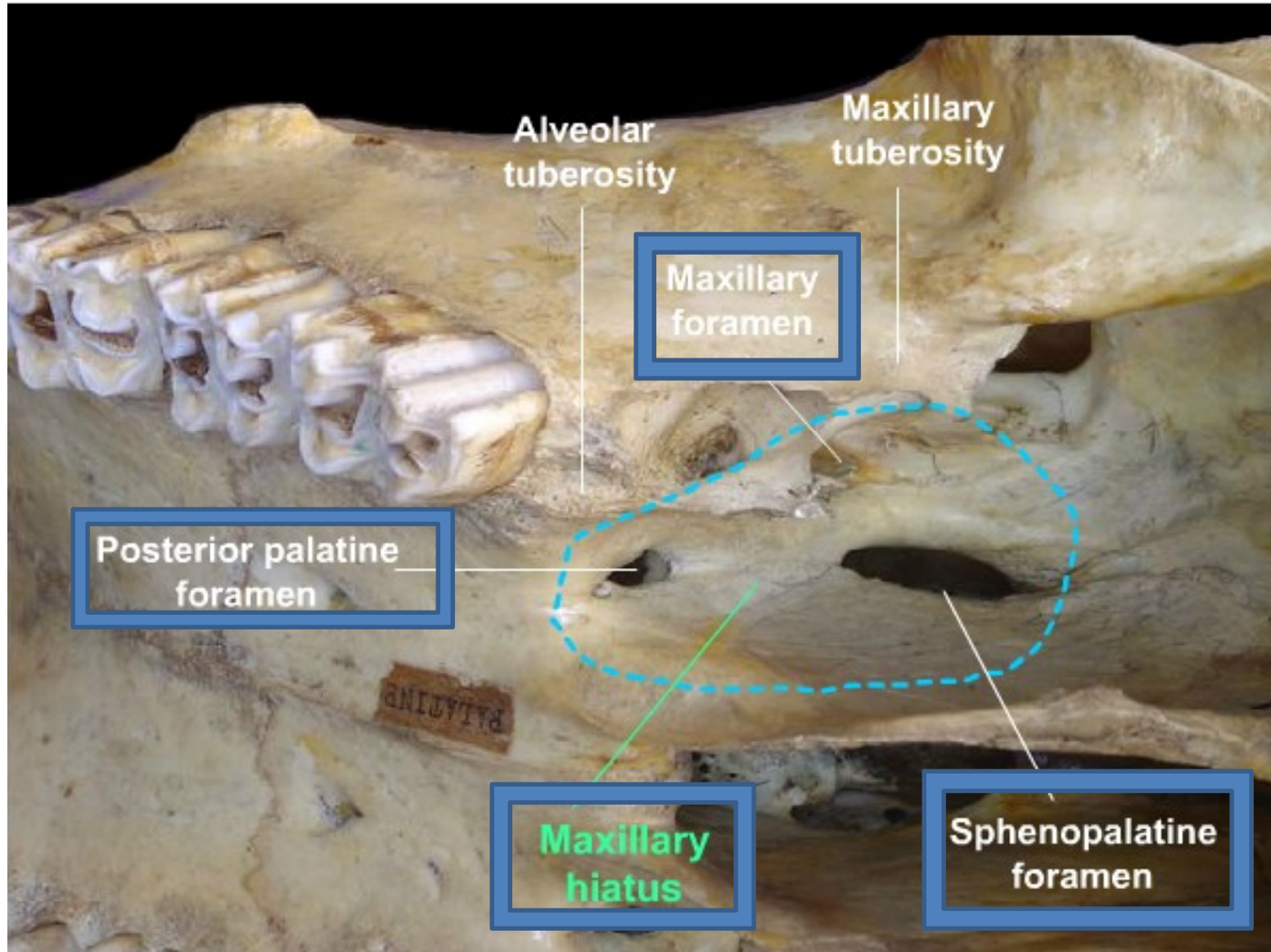
Infraorbital foramen

Facial tuberosity

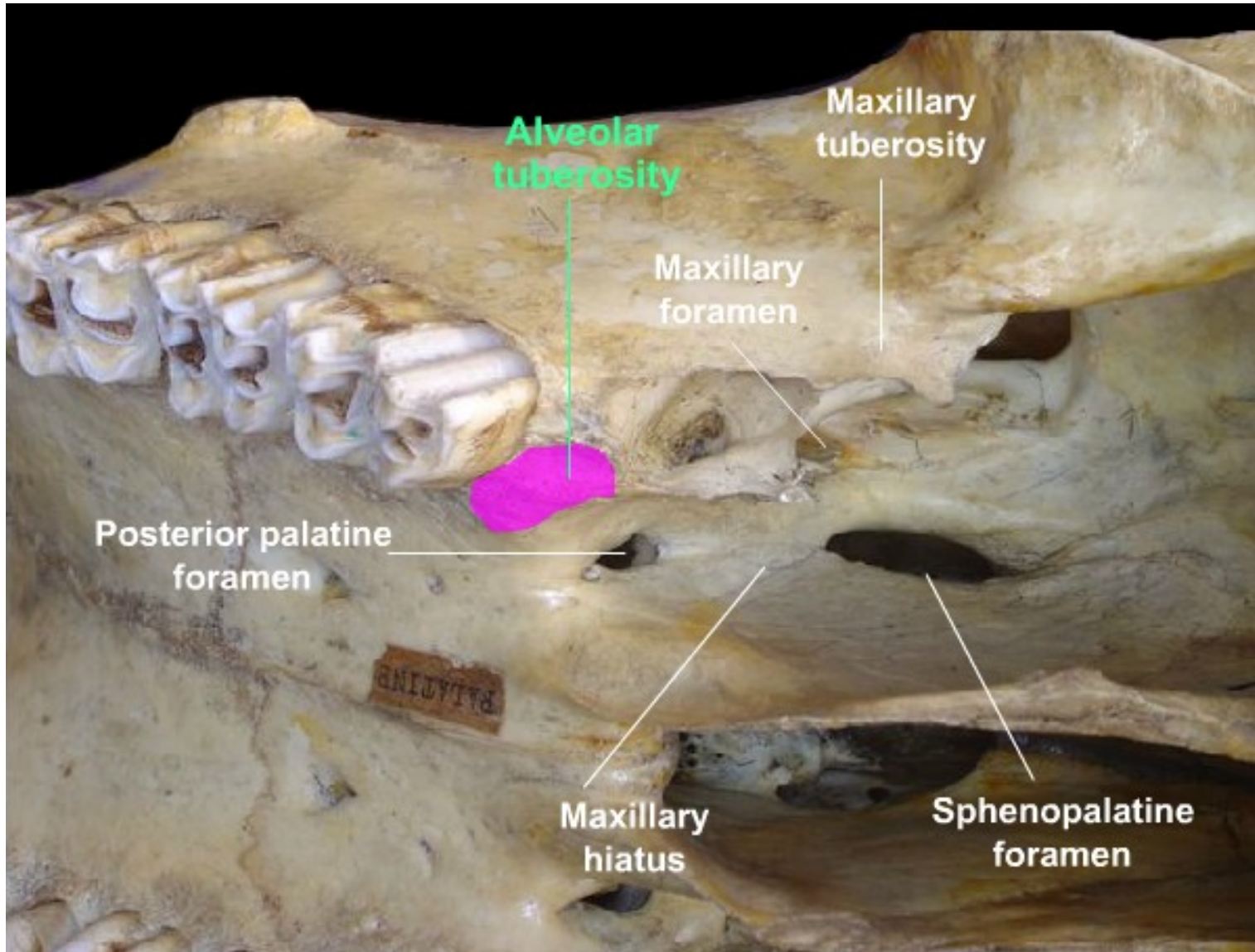
Alveoli

Alveolar border

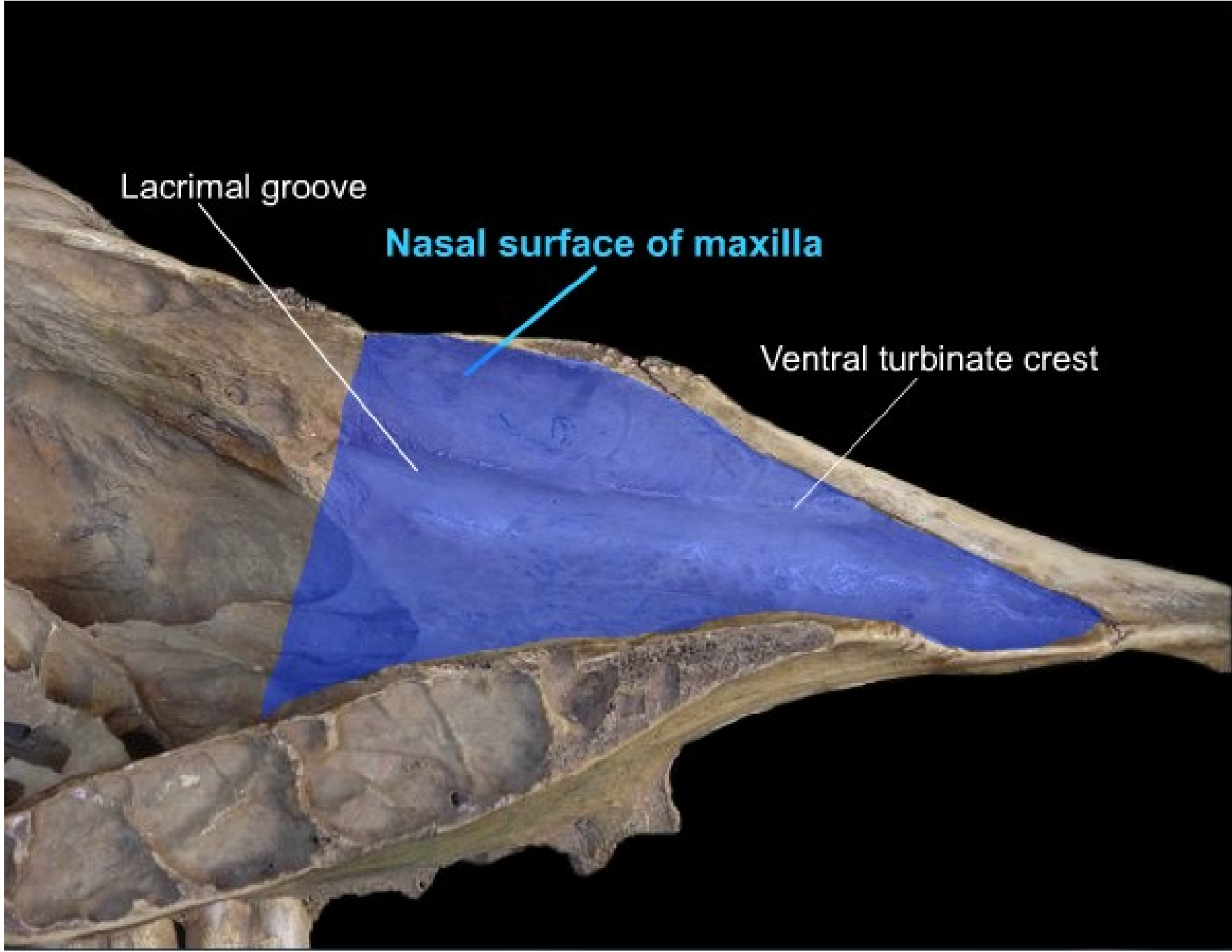
Maxilla



Maxilla



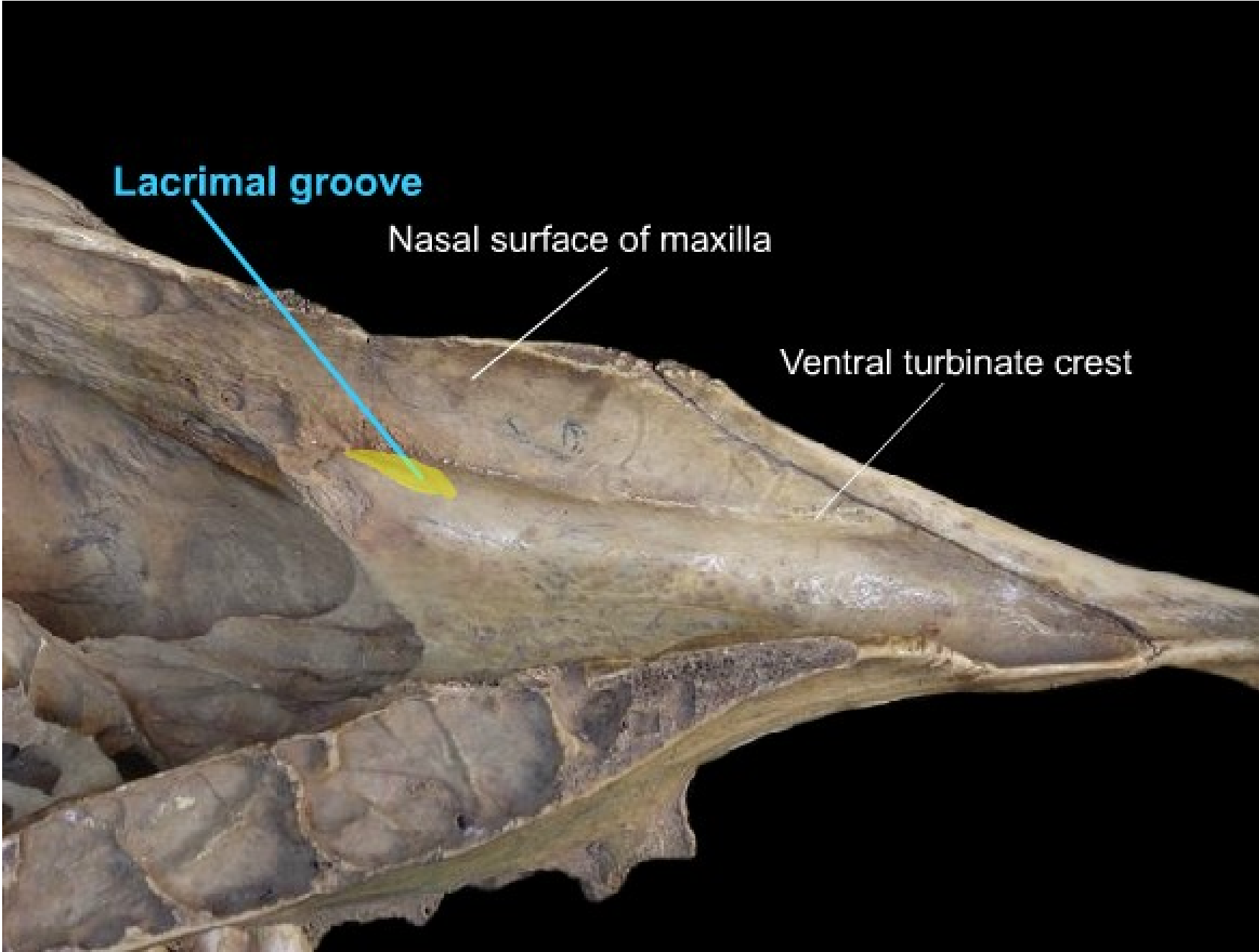




Lacrimal groove

Nasal surface of maxilla

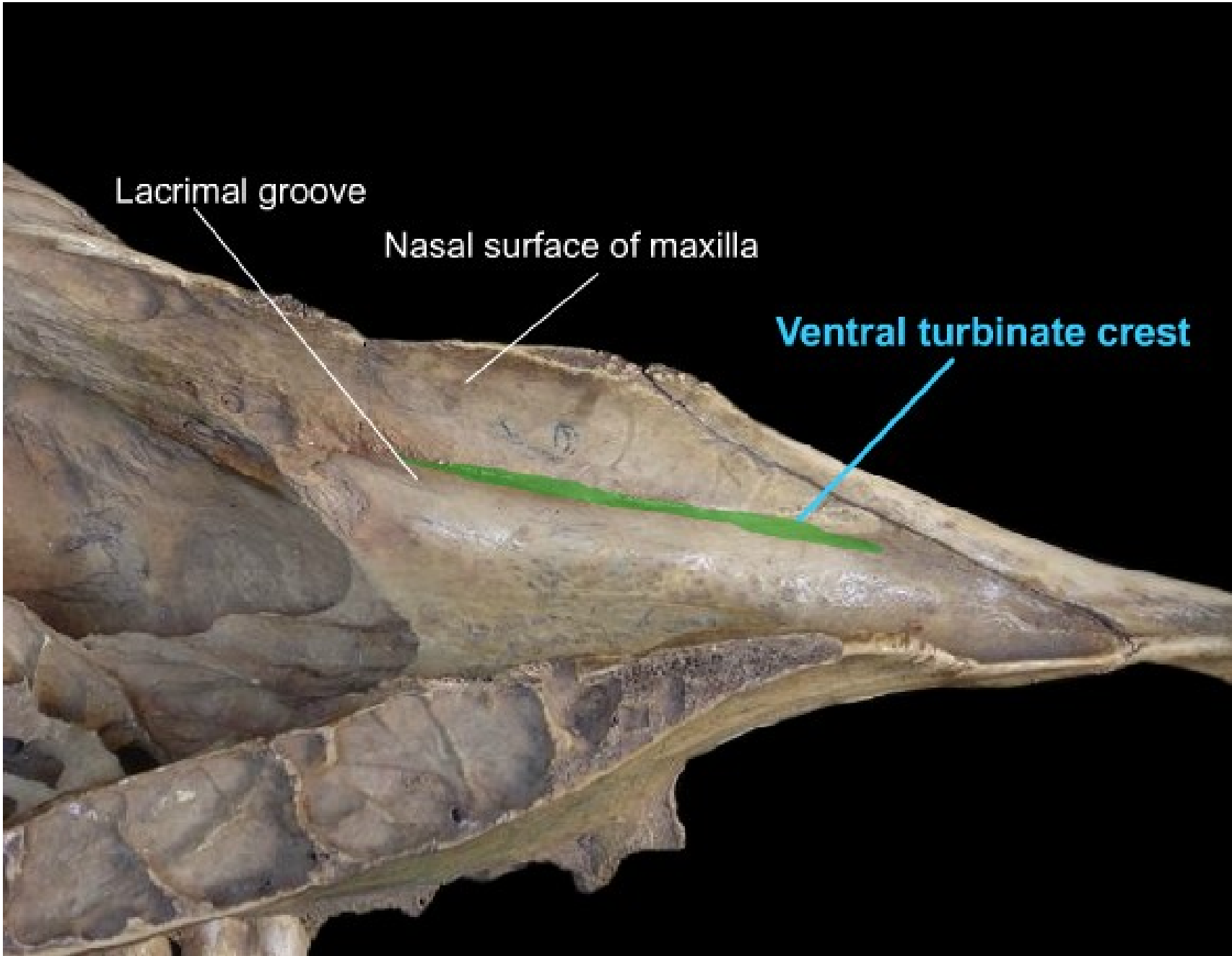
Ventral turbinate crest



Lacrimal groove

Nasal surface of maxilla

Ventral turbinate crest



PALATINE BONE

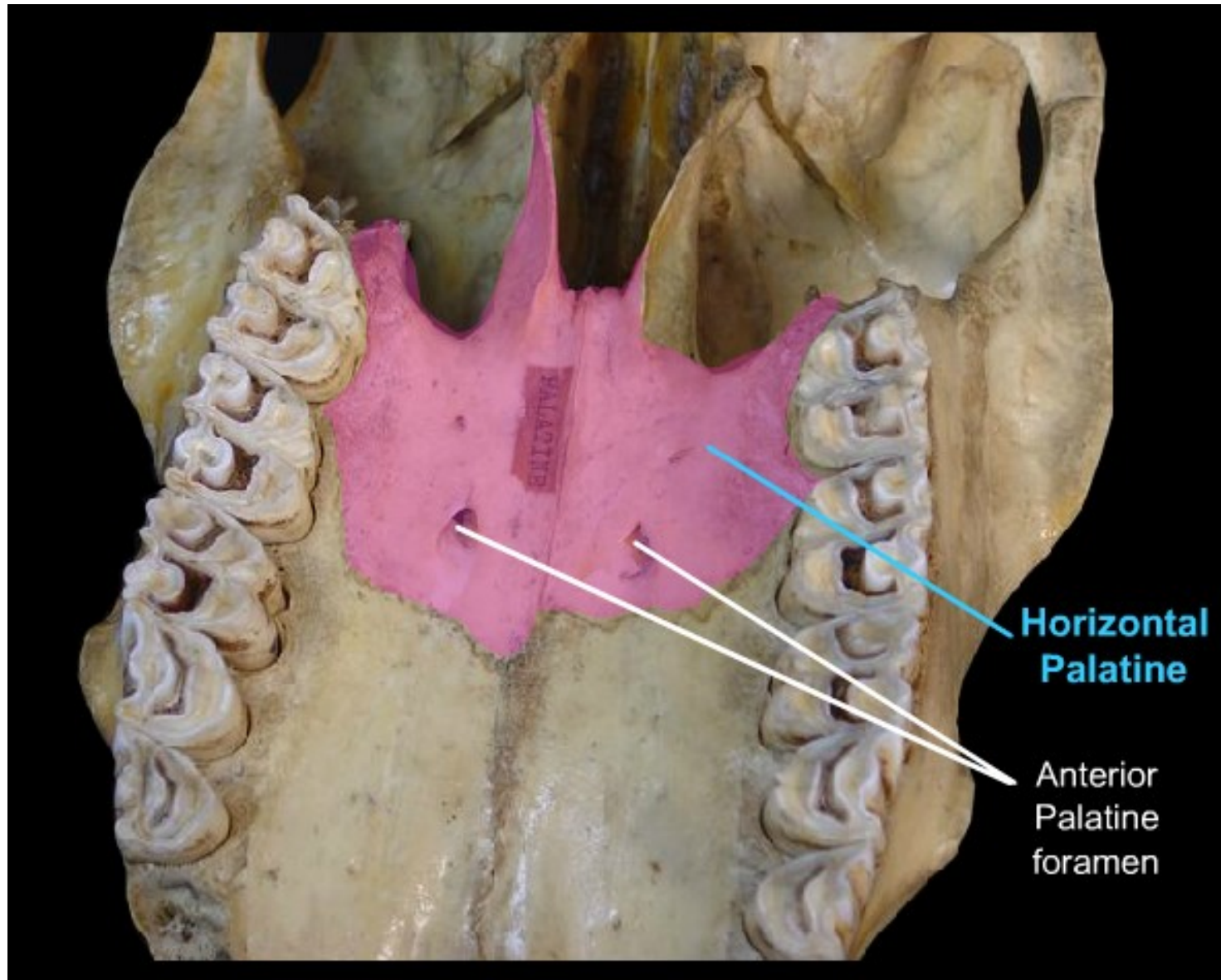
Ox

- The bones are situated on either side of the posterior nares and each consists of a horizontal and perpendicular (vertical) part.
- **Horizontal part :**
- It forms the posterior one-fourth of the bony palate.
 - Its anterior border joins the palatine process of maxilla.
 - The posterior border is free and gives attachment to the aponeurosis of soft palate.
 - Its medial border meets its fellow on the median palatine surface. Its palatine surface is perforated about its middle by the anterior palatine foramen in continuation with which is the very faint palatine groove in front.

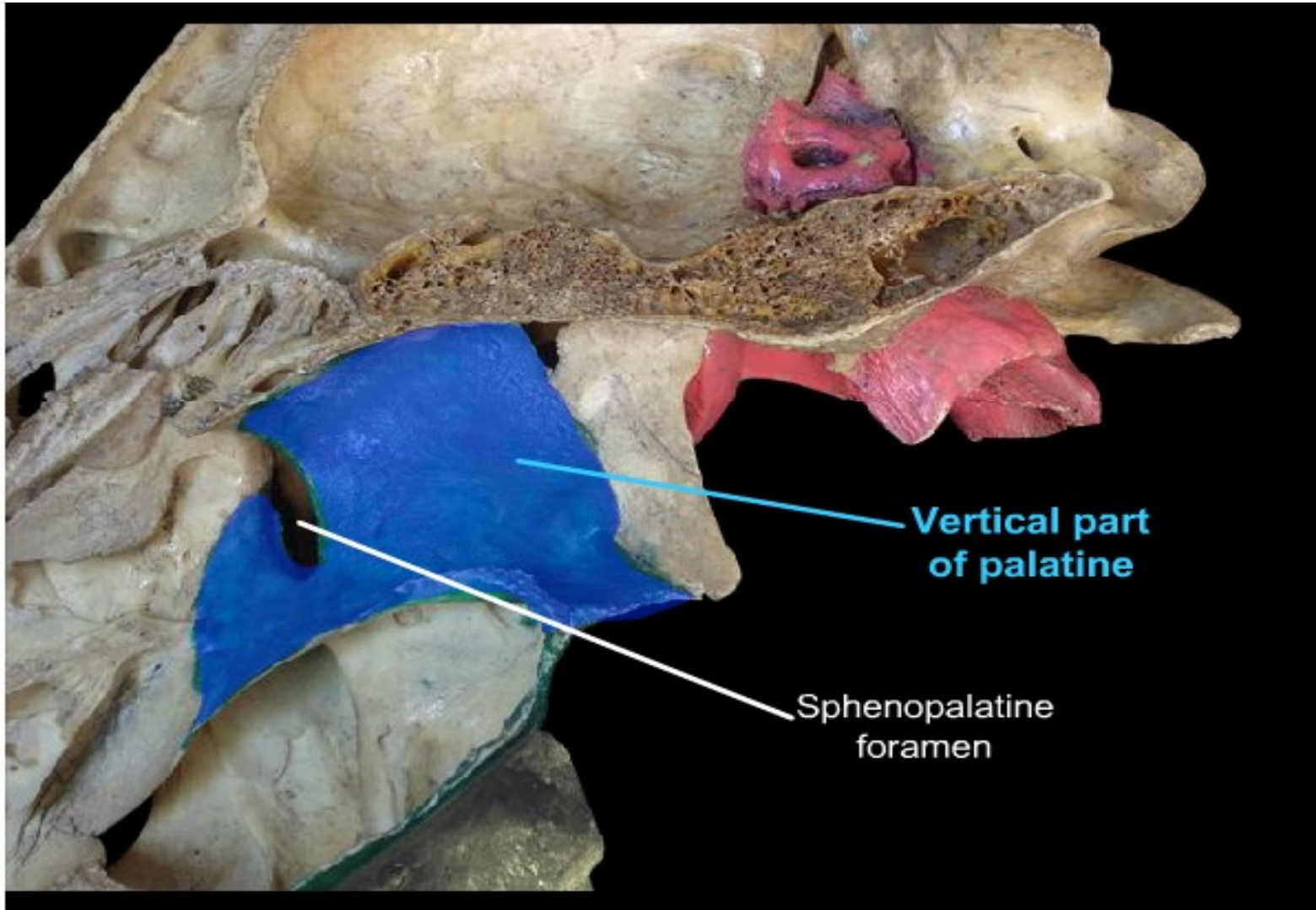
- **Vertical part**

- It forms the posterior part of the lateral wall of the nasal cavity and in part bound the posterior nares.
- It has the pterygoid articulating with it medially and the sub-sphenoidal process of the post sphenoid laterally.

Palatine



Palatine

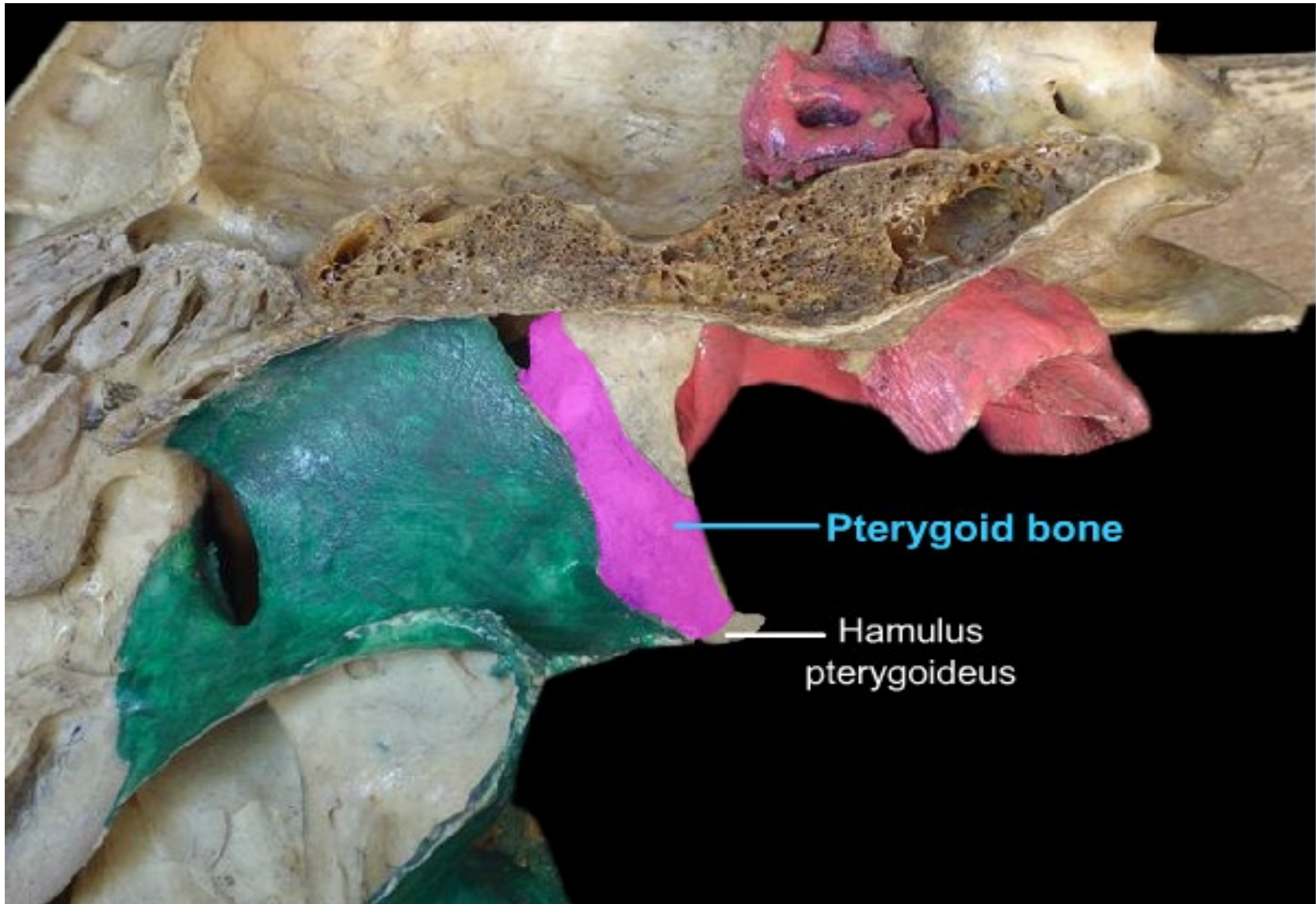


PTERYGOID BONE

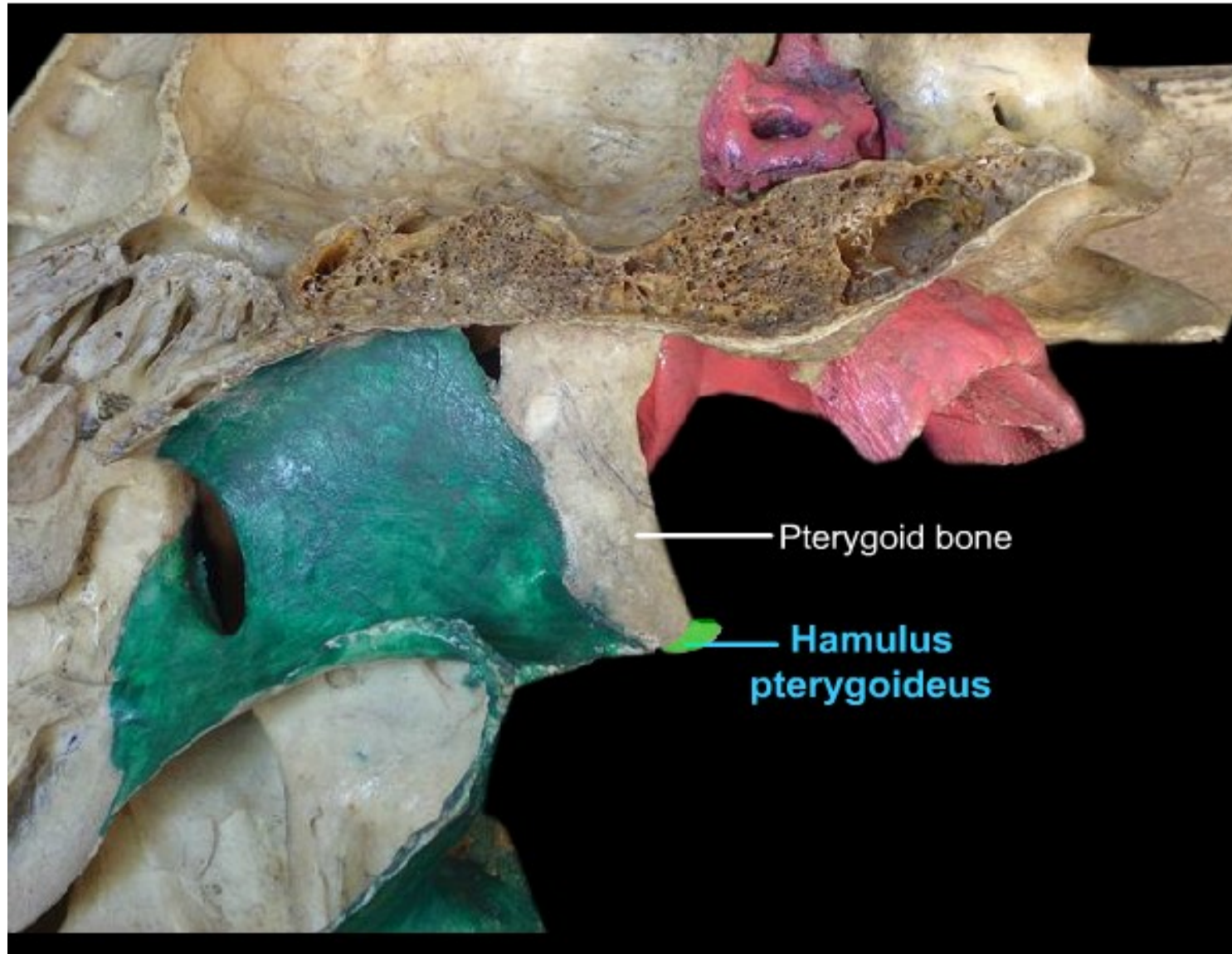
Ox:

- They are thin plates of bones situated on either side of the posterior nares located over the perpendicular parts of the palatine bones.
- The lateral face meets the palatine.
- The extreme upper part of this face forms the pterygoid or vidian canal with the sphenoid.
- The lower extremity is free and forms a curved process the *hamulus pterygoideus* around which the tendon of the *tensor palati* is reflected.

Pterygoid



Pterygoid

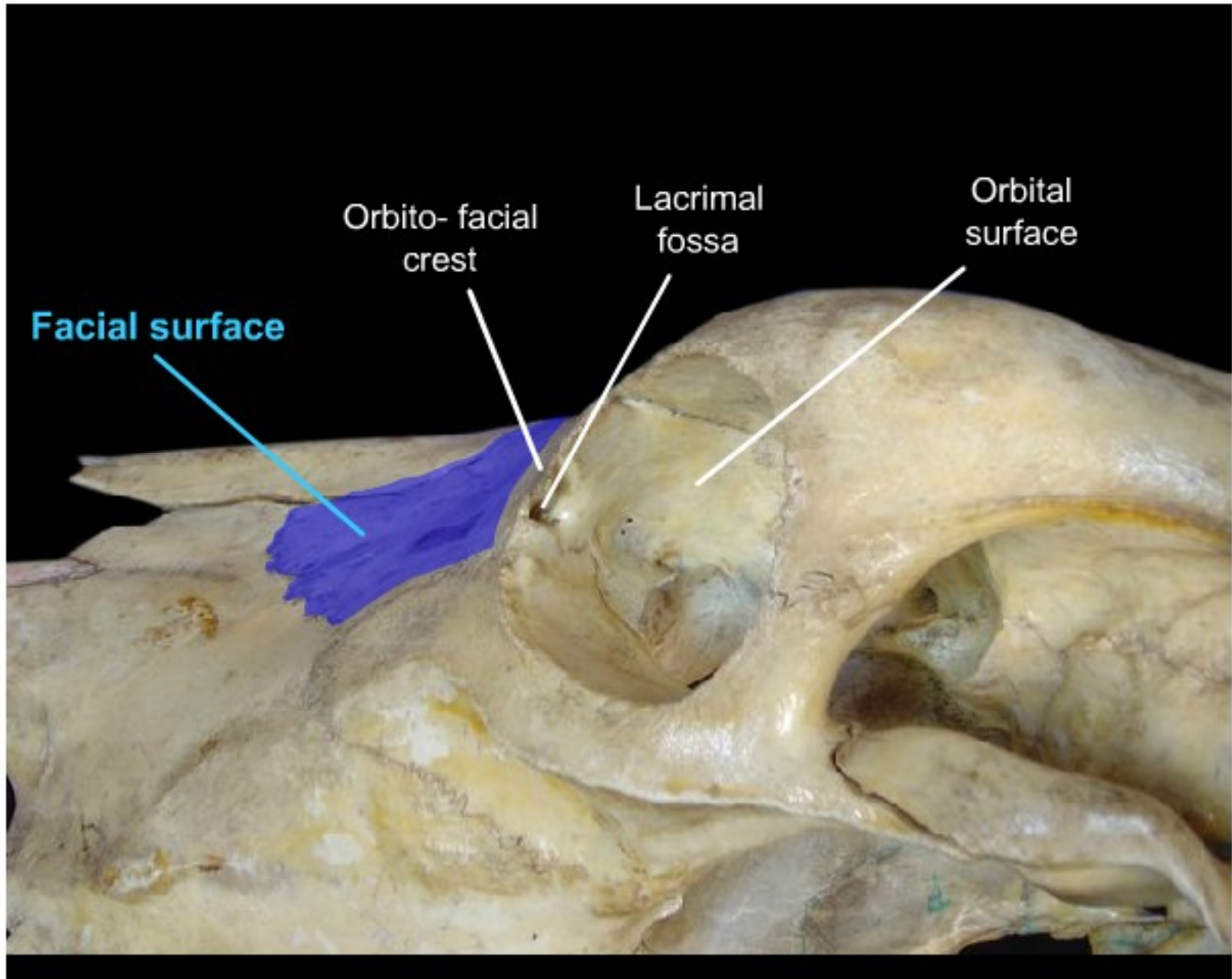


LACRIMAL BONE

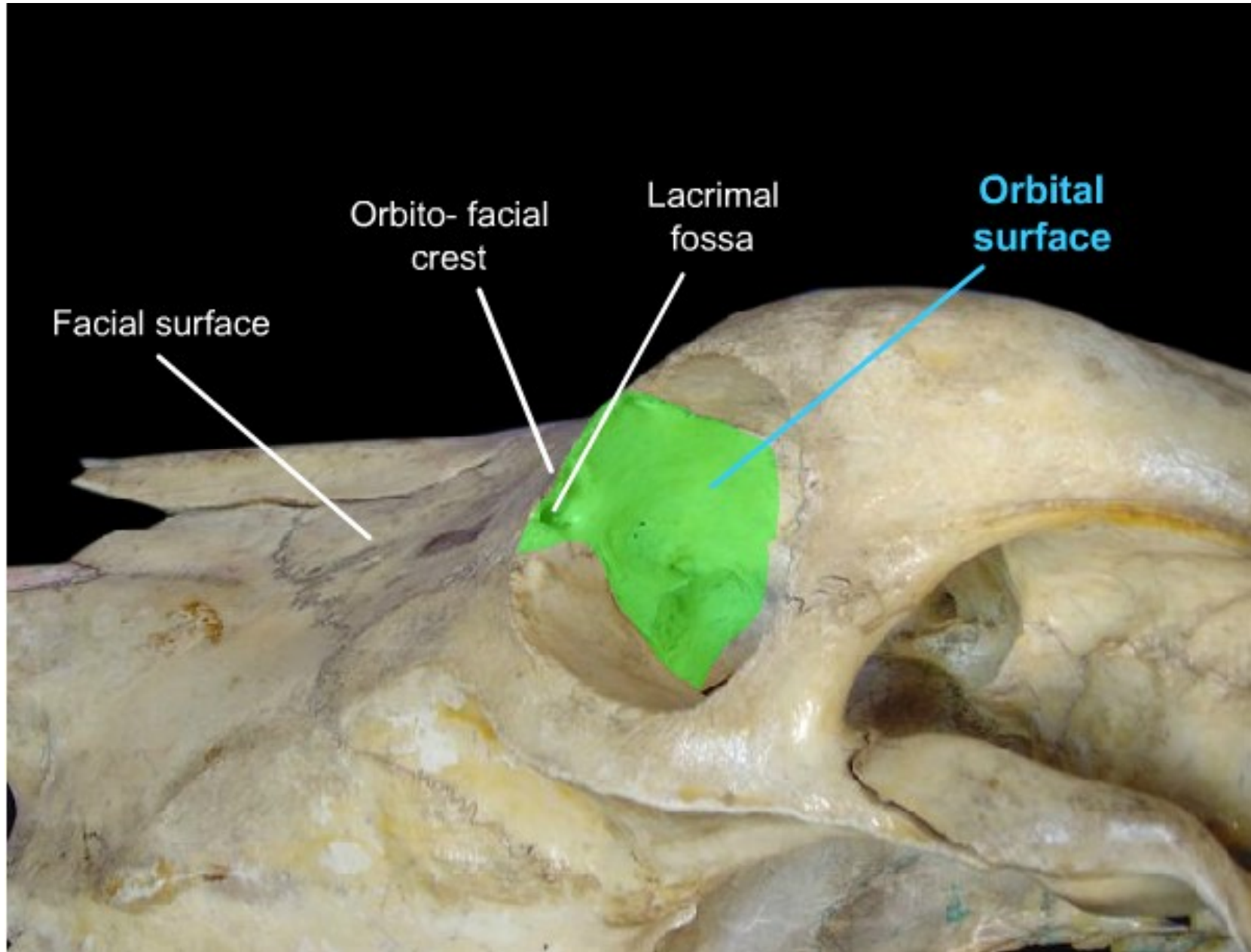
Ox

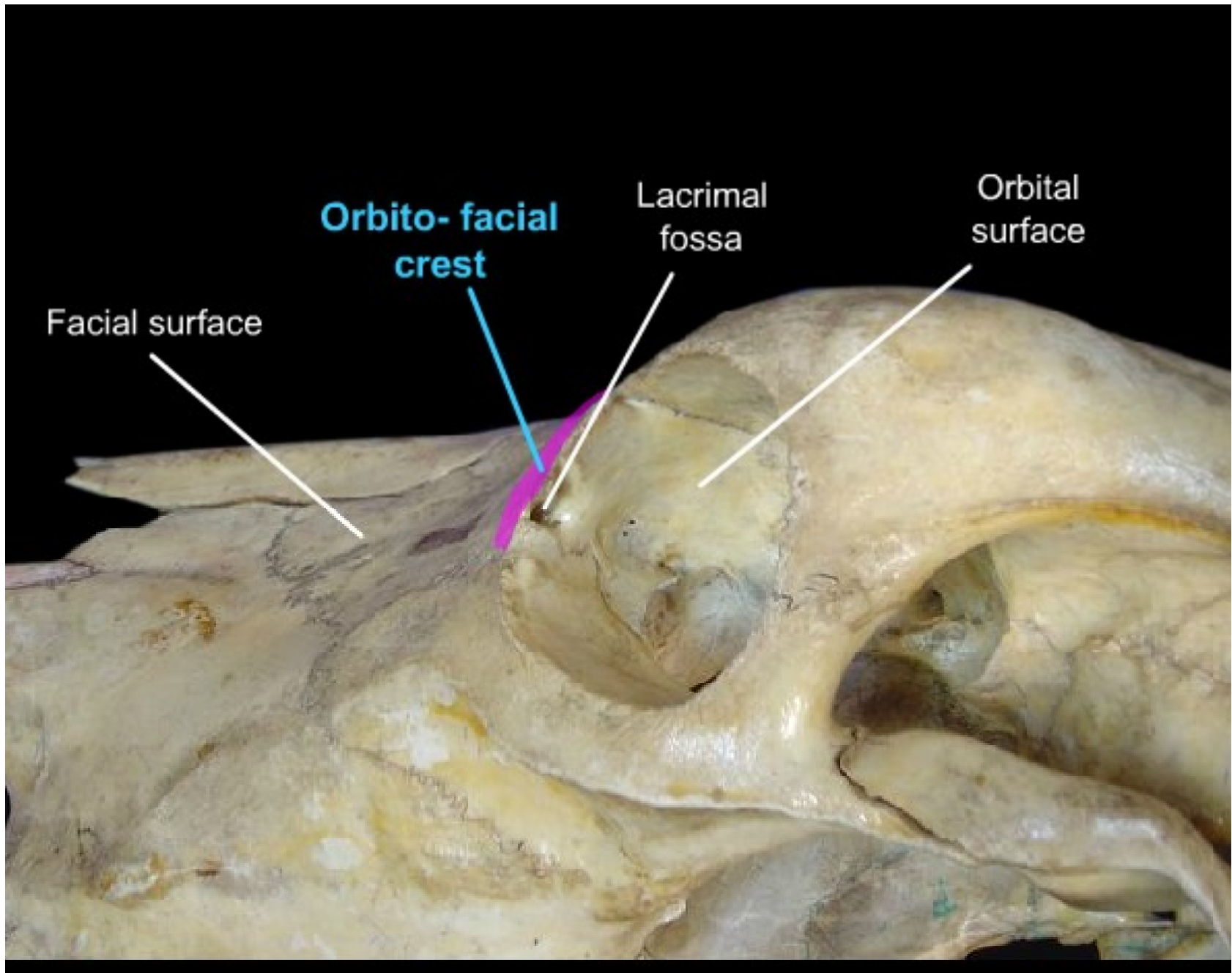
- They are situated at the anterior part of the orbits and extend forward on the face.
- The lateral surface is divided into *facial* and *orbital parts* by the orbital margin (orbito-facial crest).
- The *orbital part* forms the anterior part of the medial wall and floor of the orbit. Immediately behind the crest is the lacrimal fossa at the bottom of which is the posterior opening of the lacrimal canal. On the floor of the orbit is a large and thin walled protuberance-the *lacrimal bulla* into which the maxillary sinus extends.
- The *facial part* is extensive. The nasal (internal) face presents osseous naso-lacrimal canal, which divides it into two parts. Both the parts enter into the formation of the maxillary sinus.

Lacrimal



Lacrimal





Lacrimal

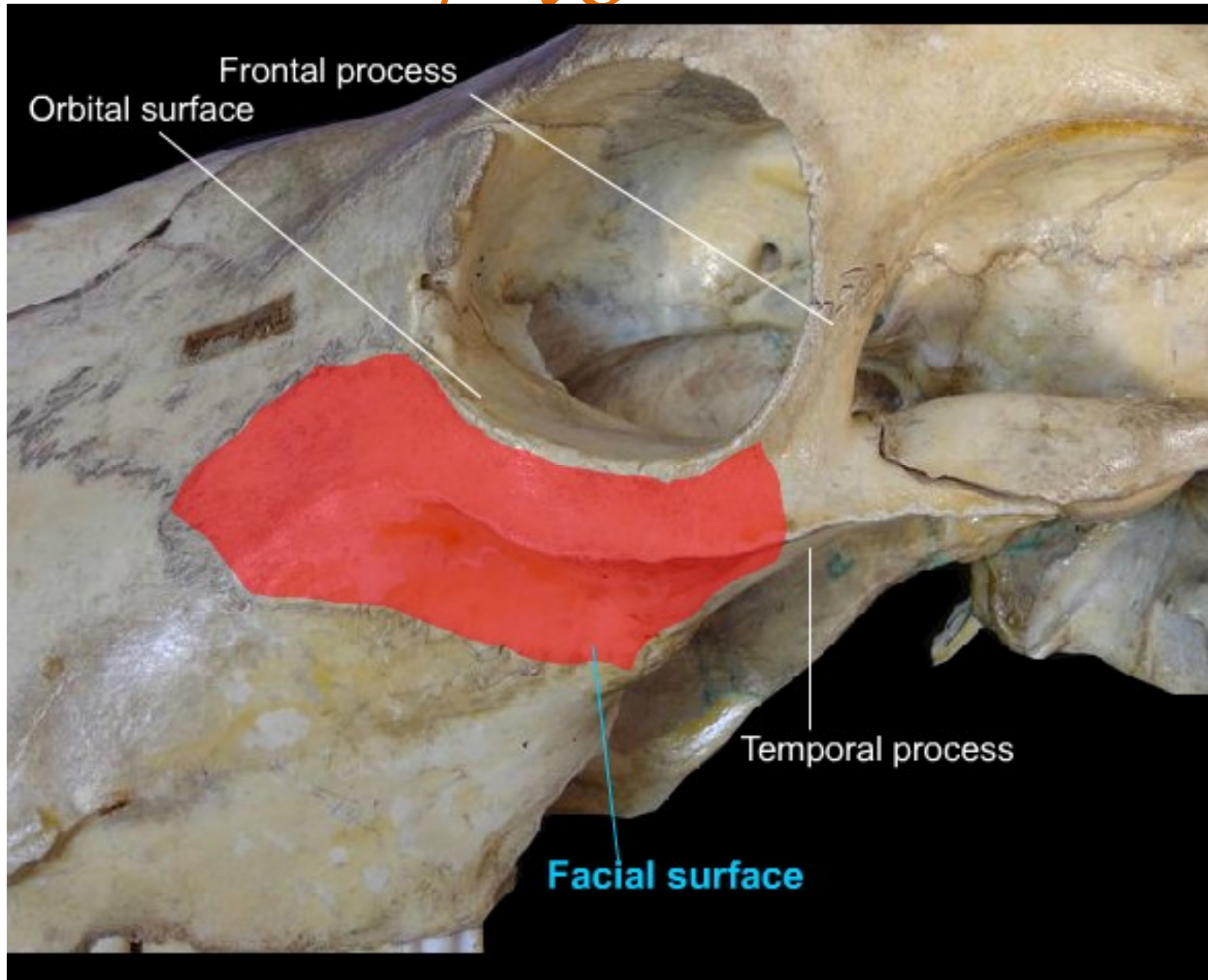


MALAR BONE

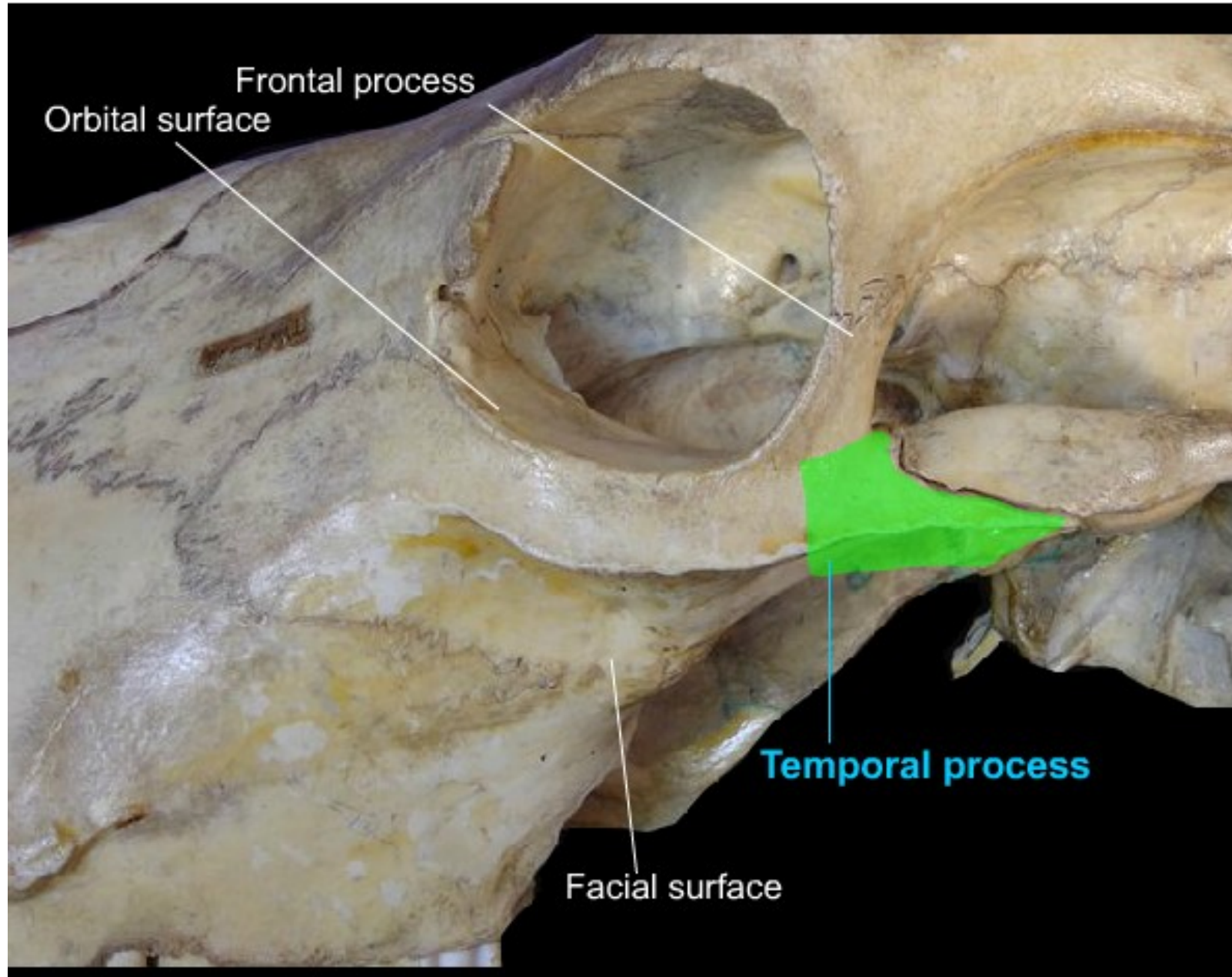
- **Ox**
- The **malar or zygomatic bone** is irregularly triangular and is situated between the lacrimal and maxilla.
- It presents three surfaces-lateral, nasal (medial) and **upper orbital**-and a **lower process**, which divided into **frontal and temporal process**.
- The **lateral or facial surface** is extensive and convex.
- The **orbital face** is narrow and forms the part of the posterior wall, a part of the floor and anterior wall of the orbit.
- A ridge separates these two surfaces and forms part of orbital rim.

- The nasal surface is free and forms part of the maxillary sinus.
- The posterior extremity is formed by the **zygomatic process** which divides into a **temporal and frontal process**.
- The **frontal process** meets the **supra orbital process of frontal** to form part of the posterior margin of the orbit.
- The **temporal process** is overlapped by the zygomatic process of the squamous temporal with which it completes the zygomatic arch.

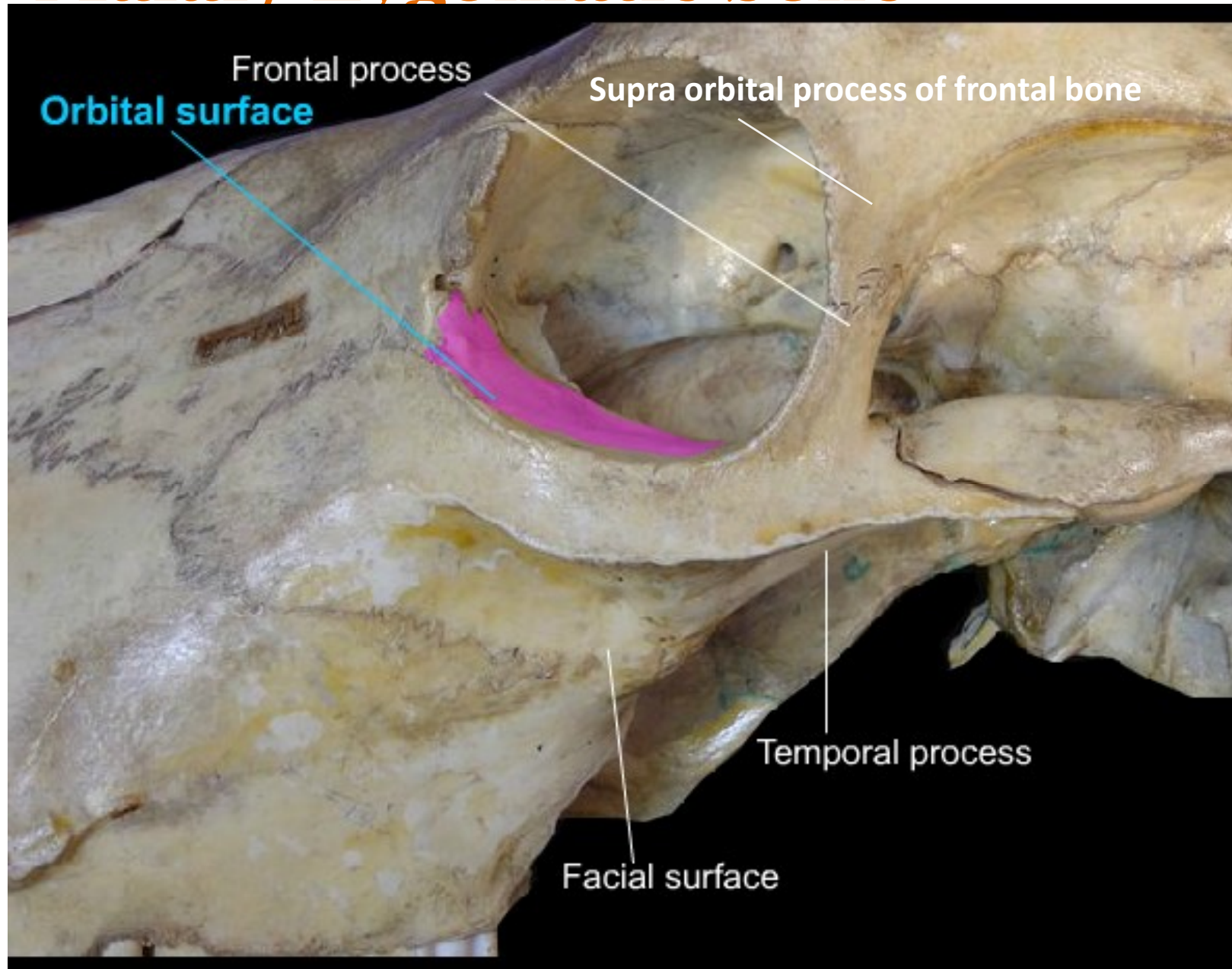
Malar/ Zygomatic bone



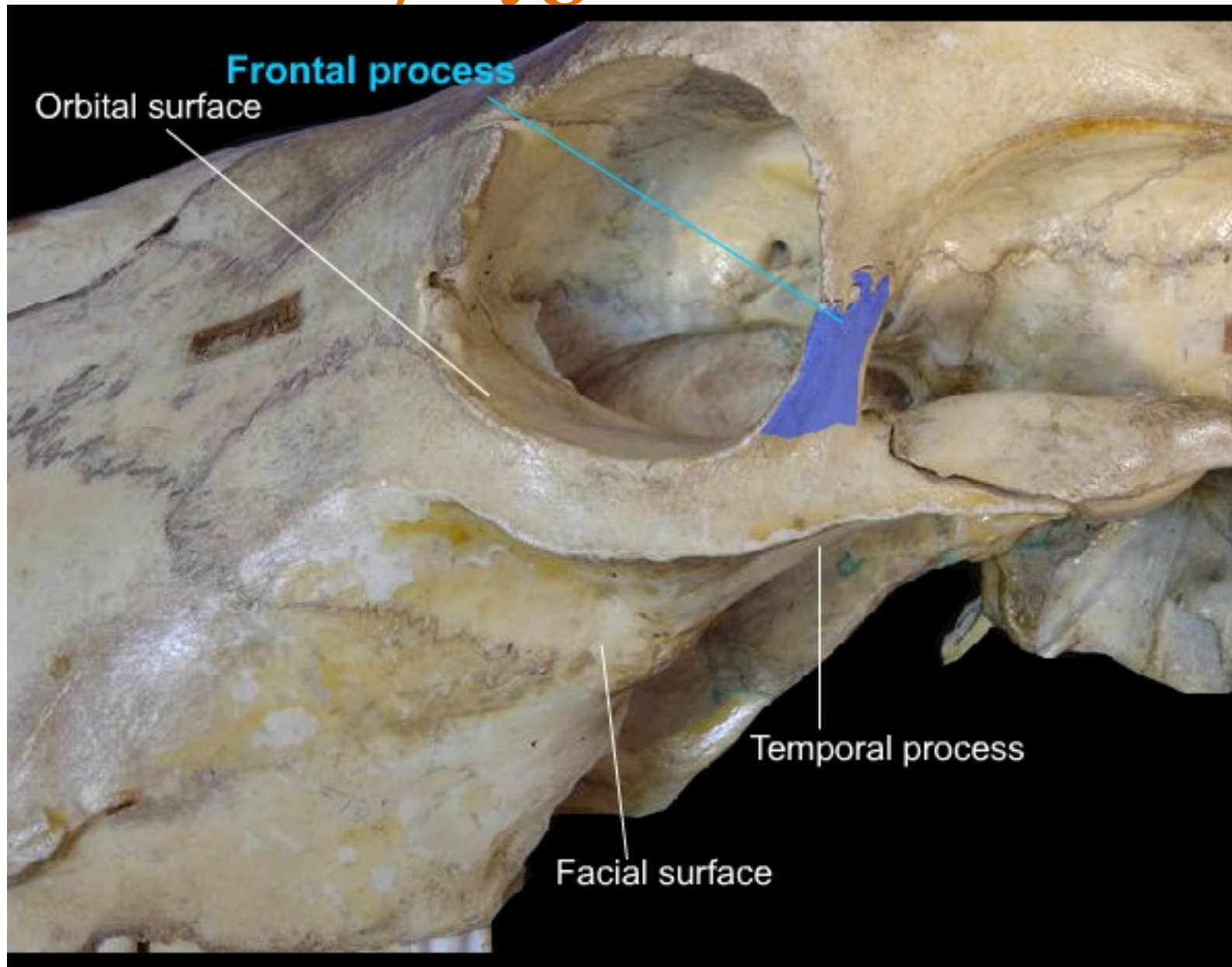
Malar/ Zygomatic bone



Malar/ Zygomatic bone

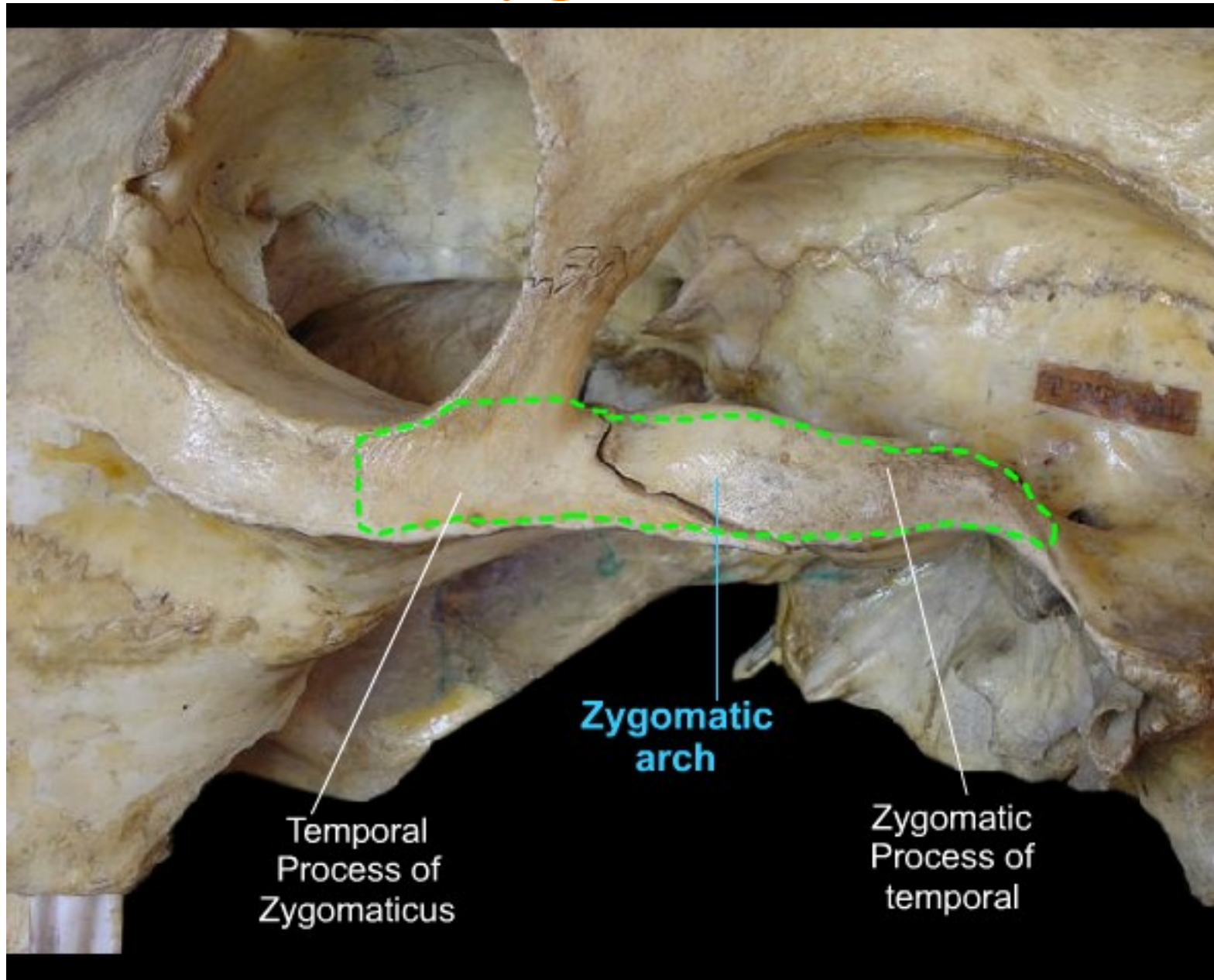


Malar/ Zygomatic bone



- **Zygomatic arch**
- Projects laterally and forms an articular area for the **mandible**.
- The articular surface is on the ventral aspect of the zygomatic arch.
- The process is united in front with temporal process of the **zygomatic bone** forming the **zygomatic arch**.
- In ruminants and horses, the arch is reinforced from above by the **supra orbital process** of the **frontal bone**.
- **Zygomatic arch is absent in pig and dog.**
- **Temporal fossa** which gives origin to the temporal muscle, is formed above and medial to the **zygomatic arch** by the temporal and parietal bones and in **carnivores and horses** it is formed by the wings of the **basisphenoid**.
- **Temporal fossa** passes forward into the orbit in domestic mammals.

Malar/ Zygomatic bone



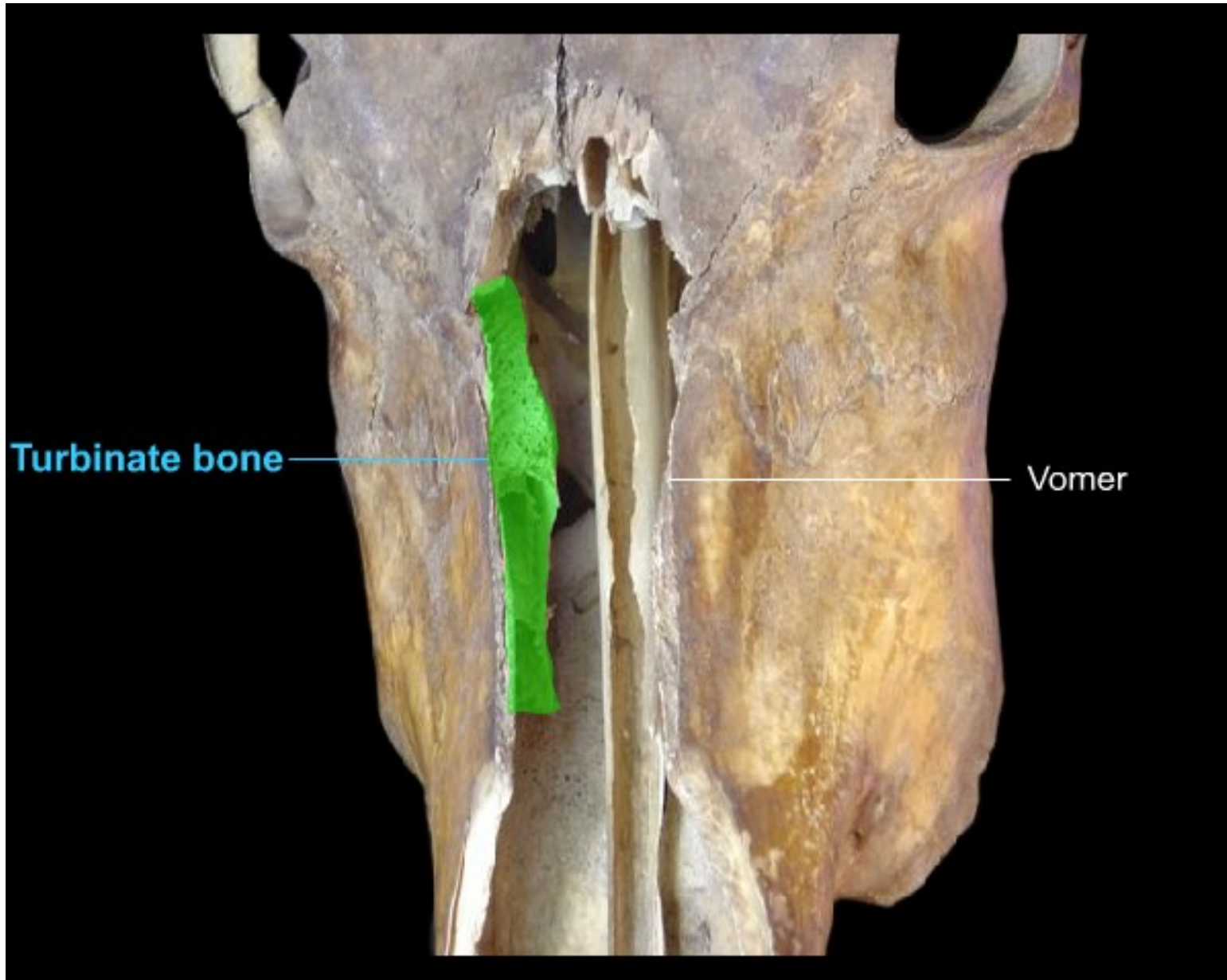
TURBINATE BONE

- **Ox**
- They are **delicate scroll like bones**, two on either side, attached to the lateral walls of the nasal cavity.
- **The dorsal turbinate** is the smaller of the two.
- The medial face is separated from the septum nasi by narrow space- the **common nasal meatus**.
- The lateral face is attached to the turbinate crest of the nasal bone.
- The posterior part joins the cribriform plate and the lateral mass of ethmoid.
- It communicates with the frontal sinus in the dry skull and this opening is closed by mucous membrane in fresh state.
- Between the **dorsal turbinate bone** and the **roof of the nasal cavity** (nasal bone) is the **dorsal nasal meatus**.
- Between the **dorsal and ventral turbinate** is the **middle nasal meatus**. The ventral turbinate is larger than the dorsal.
- The **ethmoturbinate bone** situated between the dorsal & ventral bones at their caudal part, which enlarge & form **middle turbinate bone**.

VOMER BONE

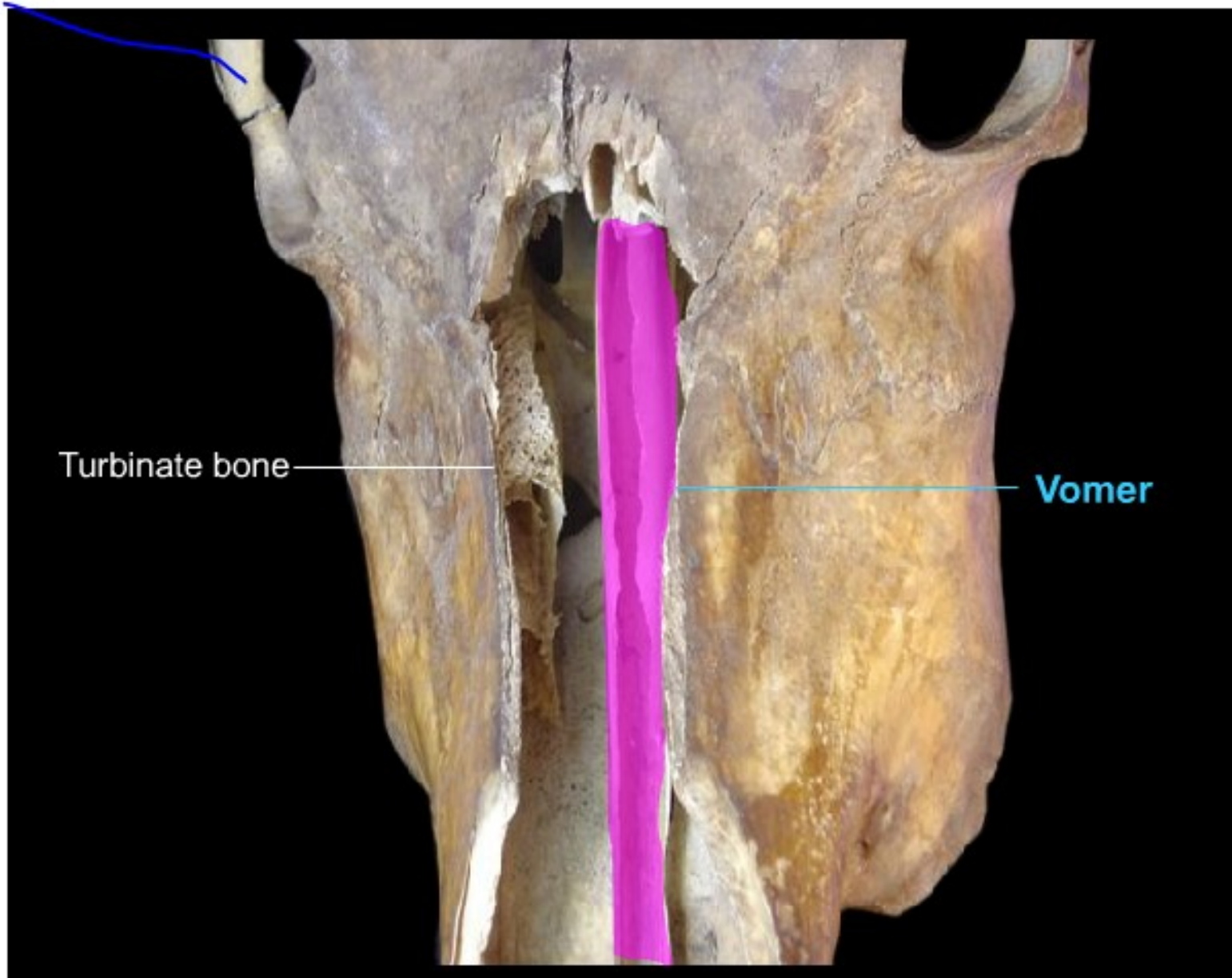
Ox

- It is a "U" or "V" shaped **median bone**, which forms the **ventral part of the septum nasi**.
- It is composed of a thin lamina, which is bent so as to form a **groove to receive** the perpendicular plate of the **ethmoid and the septal cartilage**.
- The **lateral surfaces** are covered by mucous membrane in life.



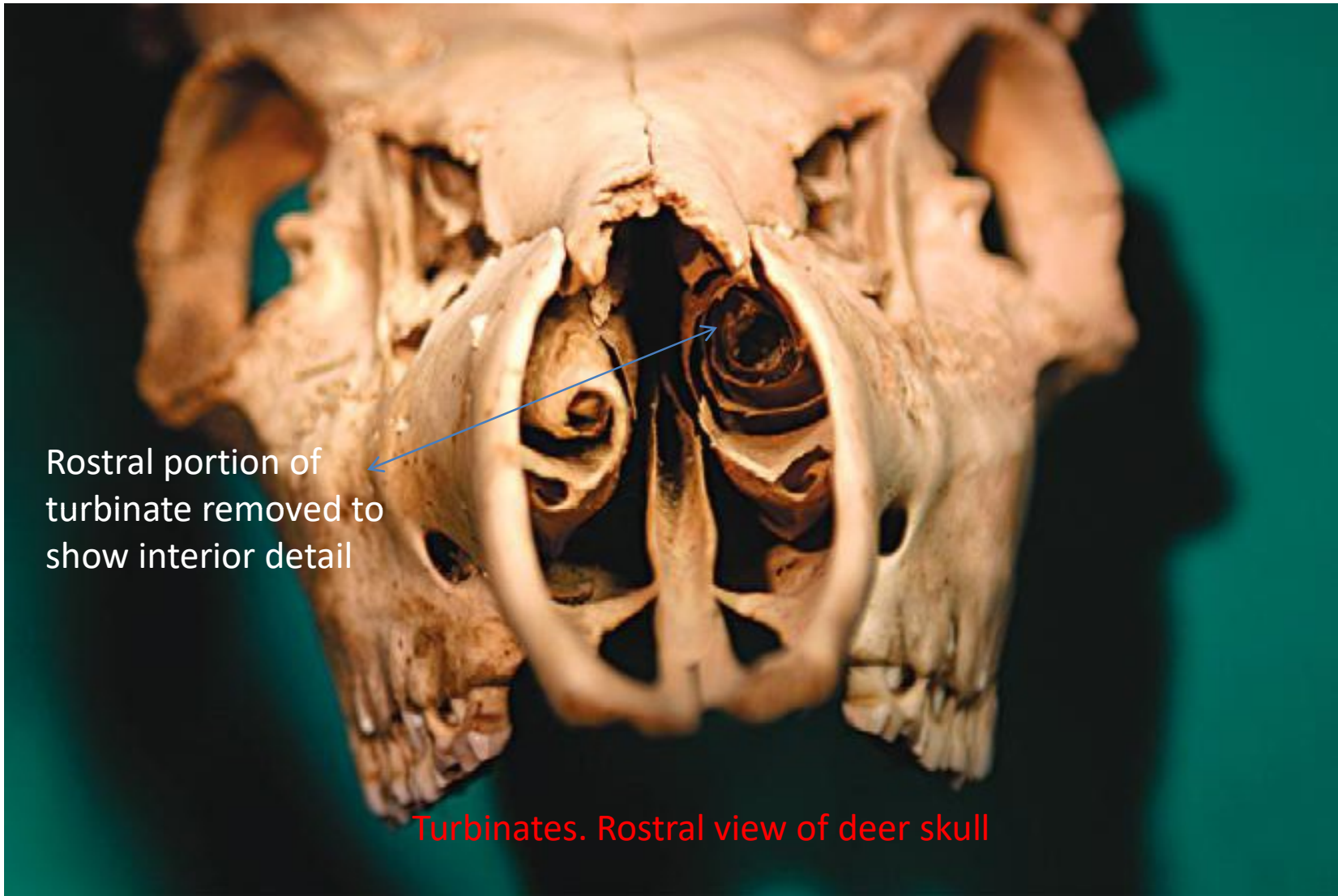
Turbinate bone

Vomer



Turbinate bone

Vomer



Rostral portion of
turbinate removed to
show interior detail

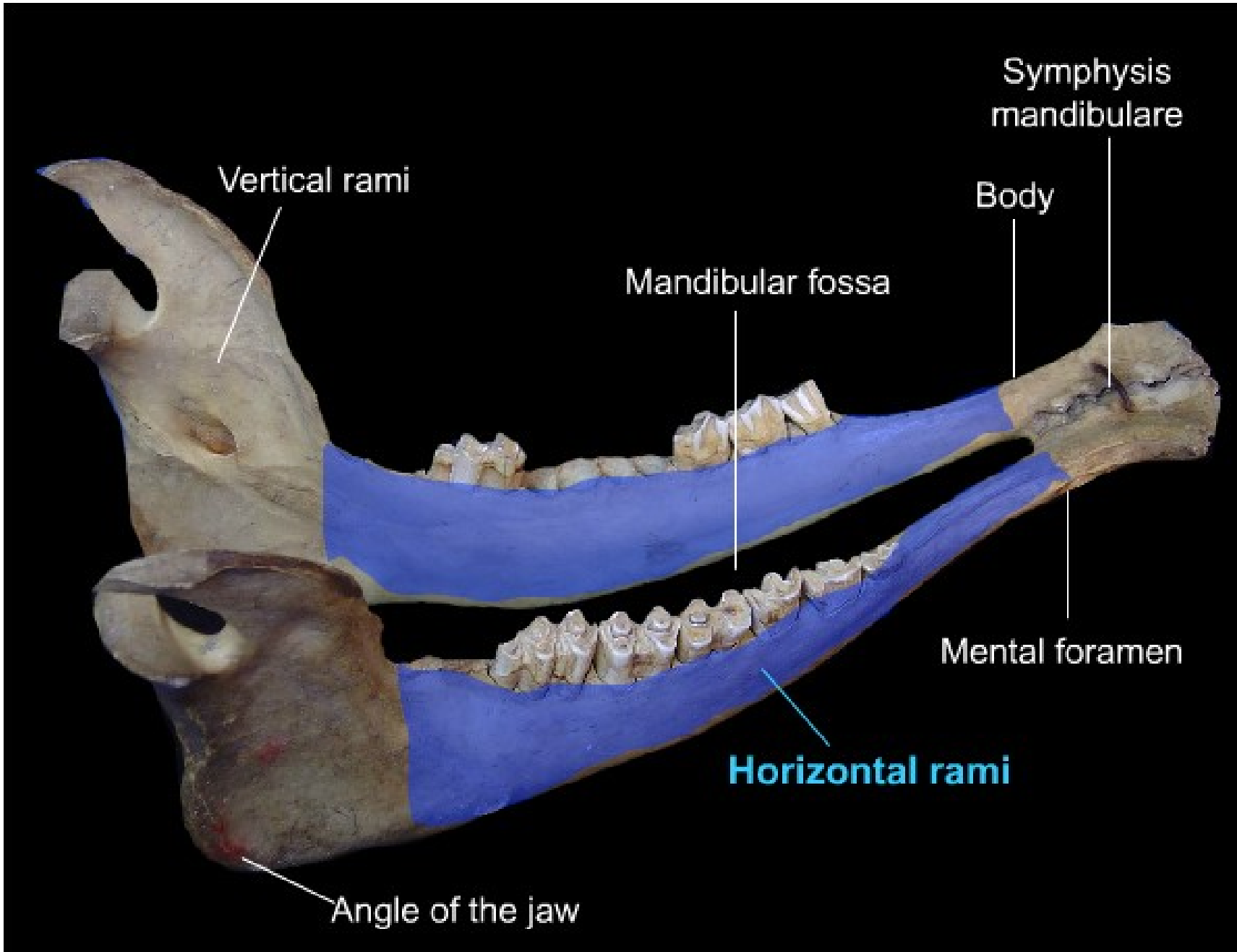
Turbinates. Rostral view of deer skull

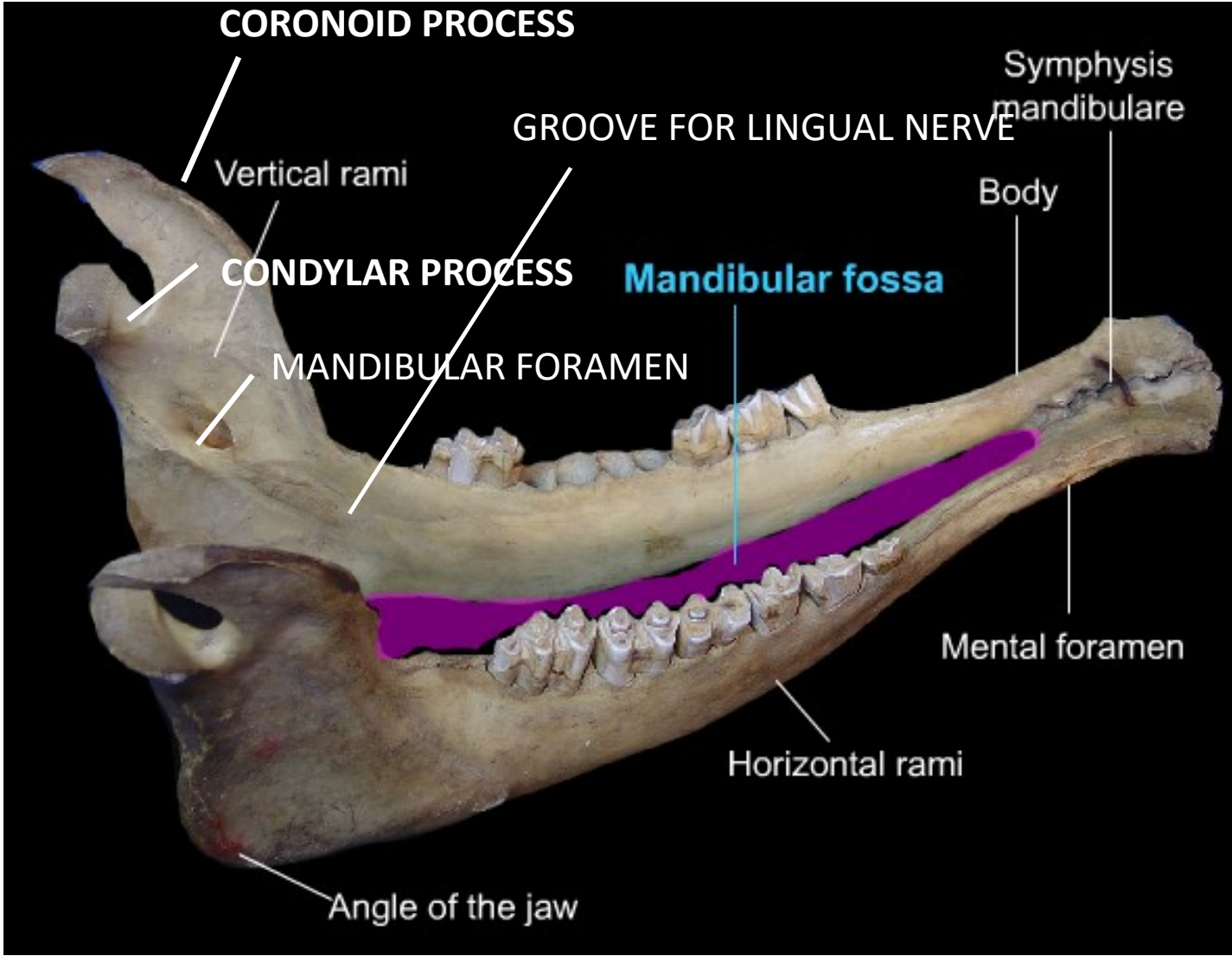
MANDIBLE OR LOWER JAW BONE

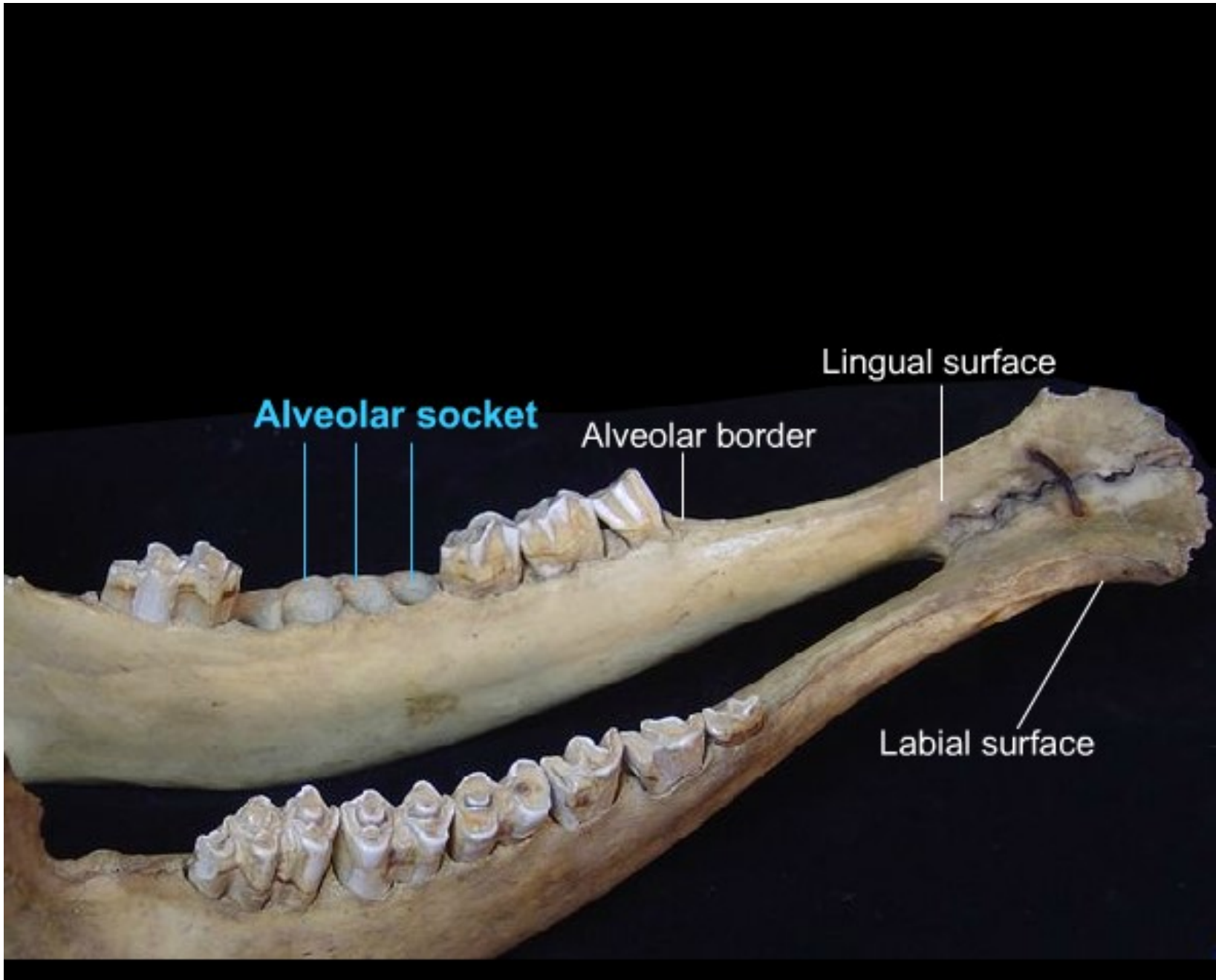
- **Ox**
- It is a single, largest bone of the face and is made up of two halves, which do not fuse completely so that a mandibular symphysis is present. It has a body and two rami.
- Body:
 - The lingual surface of the body is covered in life by mucous membrane and tip of the tongue rests on it.
 - The mental surface is related to the lower lip.
 - The symphyseal surface/symphyseal border/serrated border/medial borders are rough and irregular.
 - The alveolar/anterior border presents alveoli for the lower incisor teeth.

- *Two rami*

- The two rami diverge backward from the body and enclose the mandibular space.
- Each ramus is bent to form a horizontal part and a vertical part.
- The lateral surface is widest at the angle and narrow at either end. It is smooth and convex in the horizontal part and is nearly flat in the vertical part.
- A rough elevation near the angle and the rough line are for the insertion of the **masseter muscle**.
- It presents a fossa at its junction with the body. Placed in this fossa is the **mental foramen**-the external opening of the mandibular (inferior dental) canal.

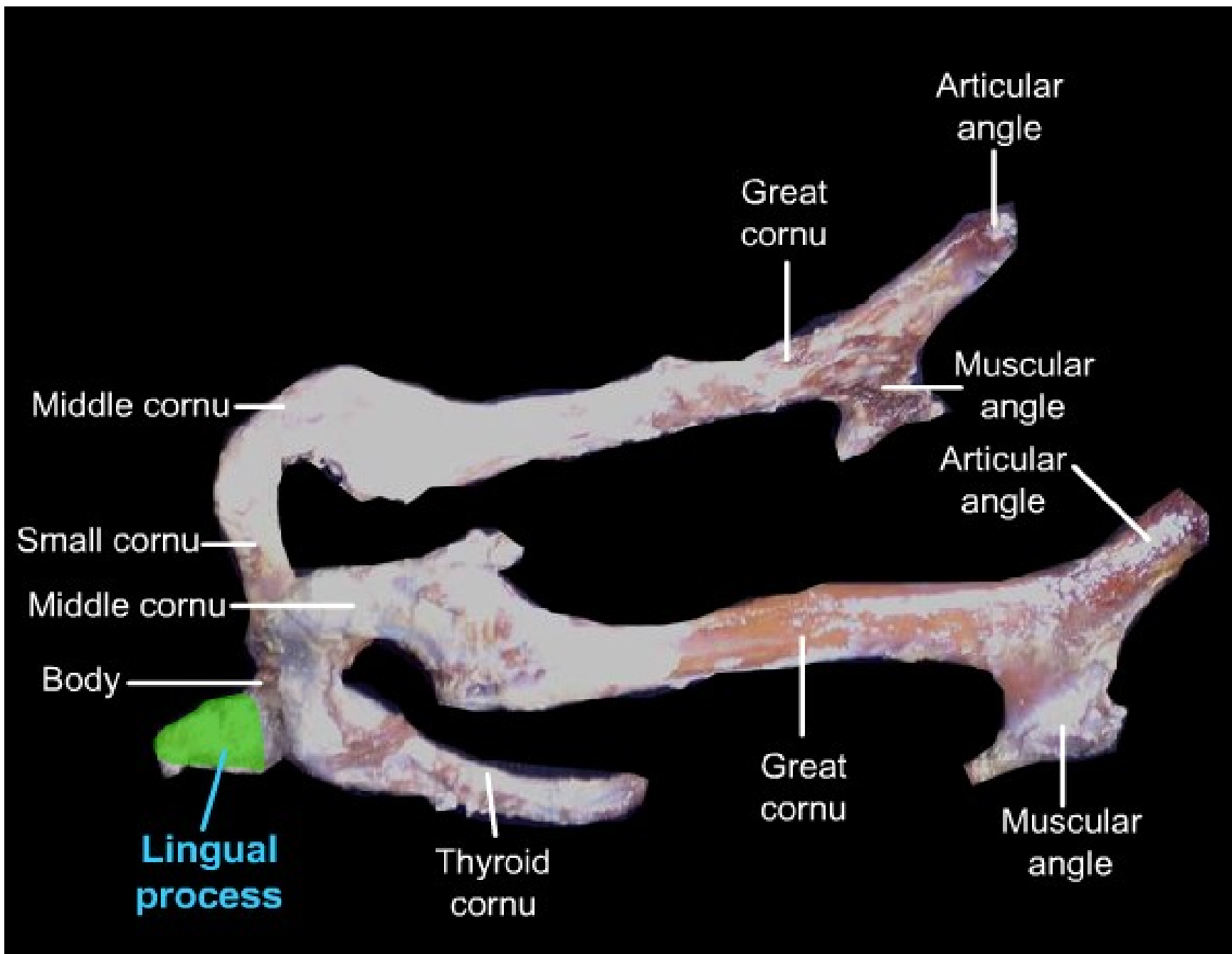






HYOID BONE

- **Ox**
- It is situated between the vertical rami of the mandible and extends obliquely downward and forward from the **temporal bone** above to the **root of the tongue** below.
- It consists of a body, a lingual (glossal) process and four pairs of cornua (stylohyoid, epihyoid, keratohyoid and thyrohyoid). (**SEKT**)
- The body or basi-hyoid is short rod of bone placed transversely.
- The body is attached to the thyroid cornua of the thyro-hyoid by bars of cartilage on the postero -lateral aspects.
- The thyroid cornua extend backward and upward from the body and are attached to the anterior cornua of the thyroid cartilage of the larynx.
- The ketato-hyoids (small cornua) are directed upward and forward and articulate by the lower ends by concave facets with the cartilage uniting the body and thyroid cornua.
- The epihyoid is a small curved rod attached to the small cornua below and the great cornu or stylo-hyoid above which is largest piece.
- The great cornu is directed upward and backward.



SINUSES OF THE SKULL (PARANASAL SINUSES)

- **Ox**
- The sinuses are **air cavities** in bones, which are lined by mucous membrane in the fresh state. They communicate with the nasal cavity directly or indirectly and hence are termed **diverticula** of the nasal cavity.
- The sinuses are found in **frontal, maxilla, palatine and sphenoid.**
- **Frontal sinus**
 - It is the **largest in Ox**, of all the sinuses and is excavated in the frontal, parietal, interparietal and supraoccipital.
- **Maxillary sinus**
 - It is formed in the **body of maxilla.**
 - It extends forward to the level of the **facial tuberosity** and upward to a line joining the **infra-orbital foramen** to the upper margin of the orbit.

- **Palatine sinus:**

- It is formed in the **palatine processes** of **maxilla**, and **horizontal part** of **palatine bones**.
- It is separated from its fellow by a **bony septum**.
- It extends from **posterior border of the palatine** to about an inch in front of the level of the **first cheek tooth**.
- It communicates with the **maxillary sinus** laterally and is separated from the **ventral meatus** medially by mucous membrane in life.

- **Sphenoidal sinus:**

- It is excavated in the body of the **presphenoid** and extends into the **orbital wing**.
- It is smallest of the **four sinuses** and communicates with the **ventral ethmoidal meatuses**.

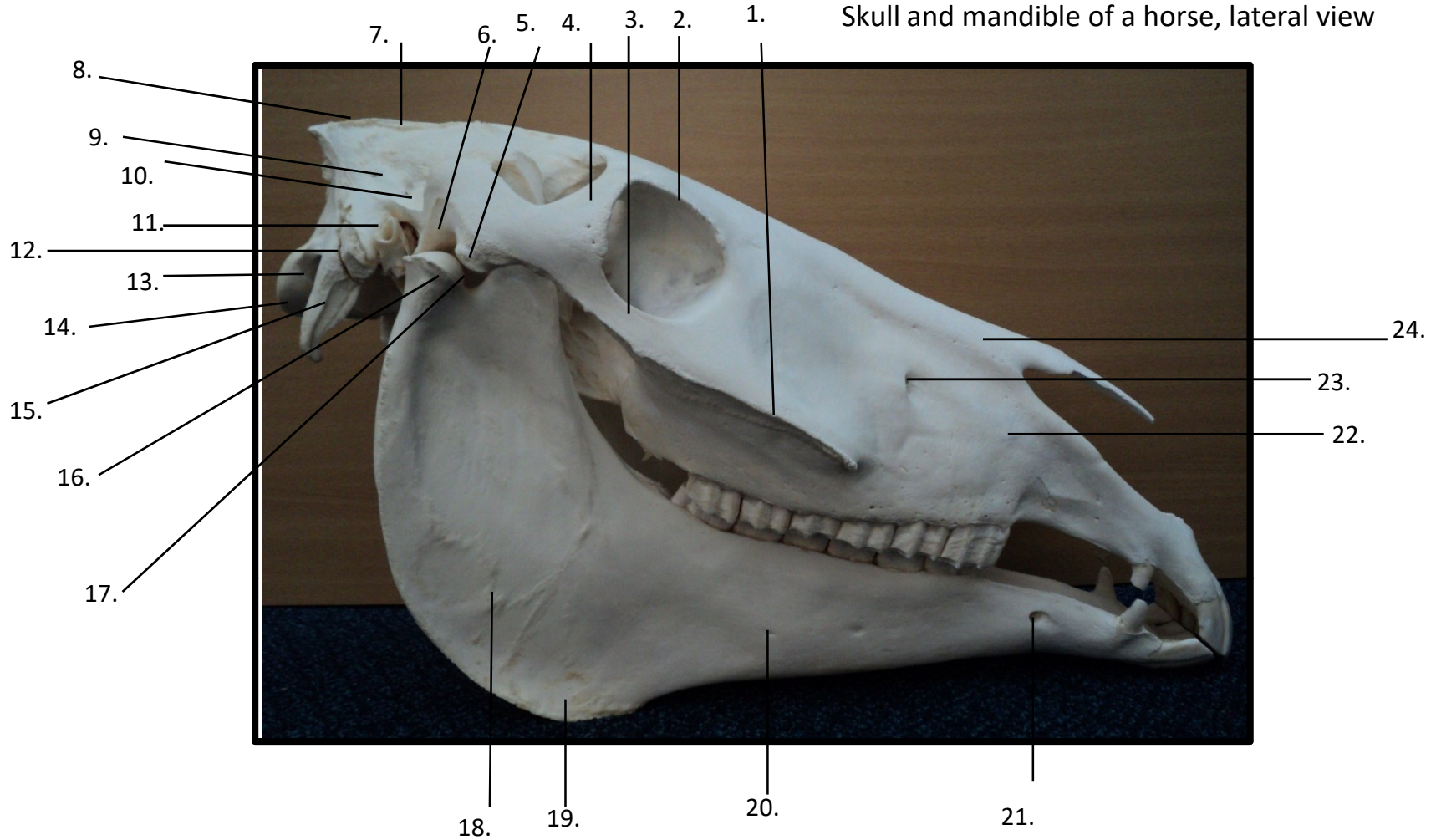
- **Horse**
- The sinuses are Frontal, Maxillary, Spheno-palatine and Ethmoidal.
- **Maxillary sinus**
 - It is the **largest in Horse** and is formed by the maxilla, lacrimal malar, posterior turbinate and lateral masses of ethmoid.
- **Frontal or Fronto-turbinate sinus**
- It is formed in the frontal, lacrimal, ethmoid and dorsal turbinate bone. It consists of frontal and turbinate parts.
- **Spheno-palatine sinus**
 - It is formed in the body of presphenoid and vertical part of the palatine bone.
 - It communicates with the medial part of the posterior compartment of the maxillary sinus.
- **Ethmoid sinus**
 - It is the largest cavity in the ethmo-turbinate.
 - It communicates with the maxillary sinus.

Differential study of cranial and facial bones

Skull Of Horse

- Skull of Horse is long and four-sided.
- **Foramen lacerum** is extensive.
- Zygomatic process of lacrimal meets **malar** as well as **supraorbital process**.
- **Inter-parietal** is centrally placed and considered as a single bone.
- **Parietal bones** forms the roof of the cranial cavity.
- At the junction between pre-maxilla and maxilla there is socket for **canine tooth**.

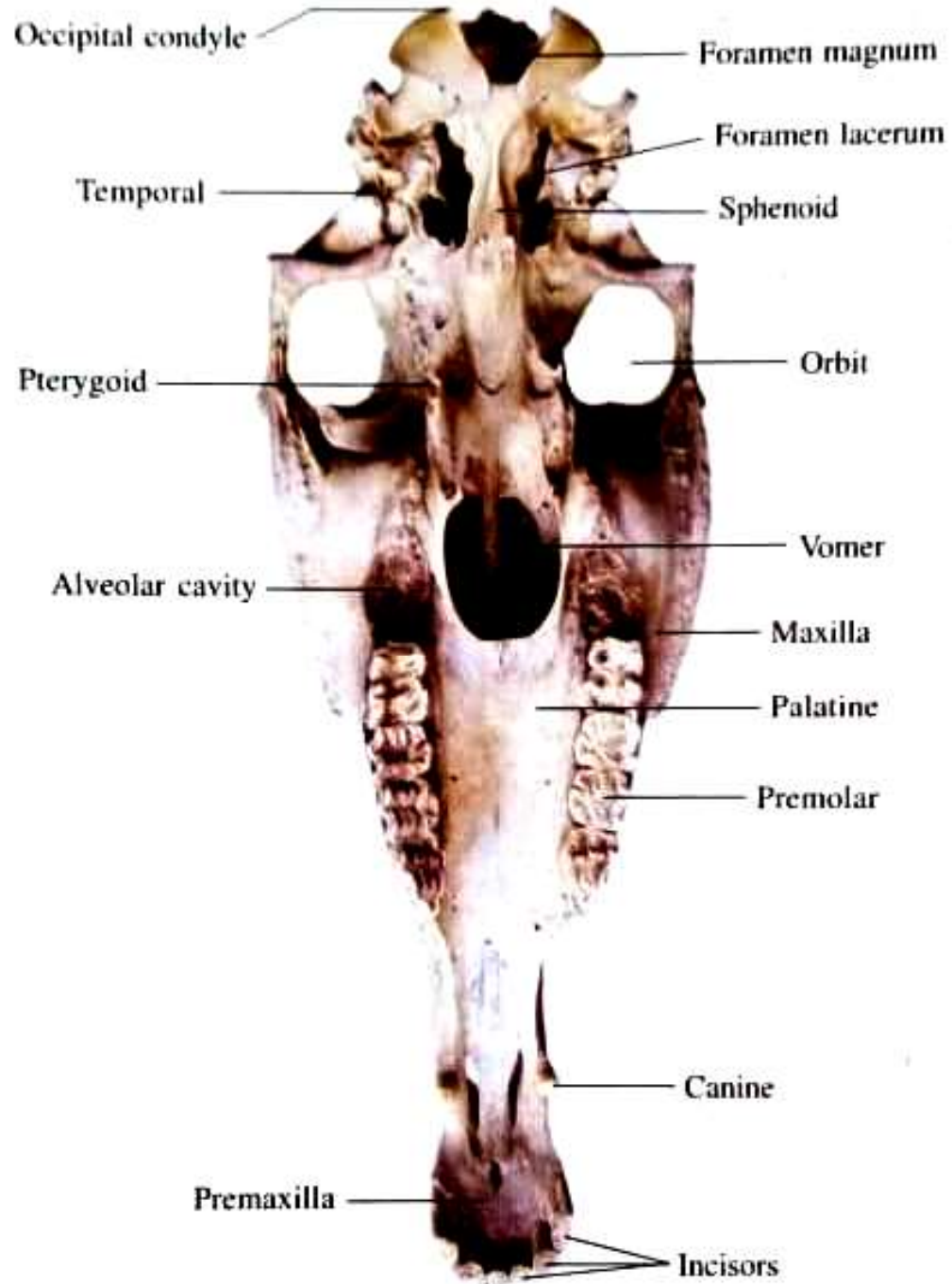
Skull and mandible of a horse, lateral view

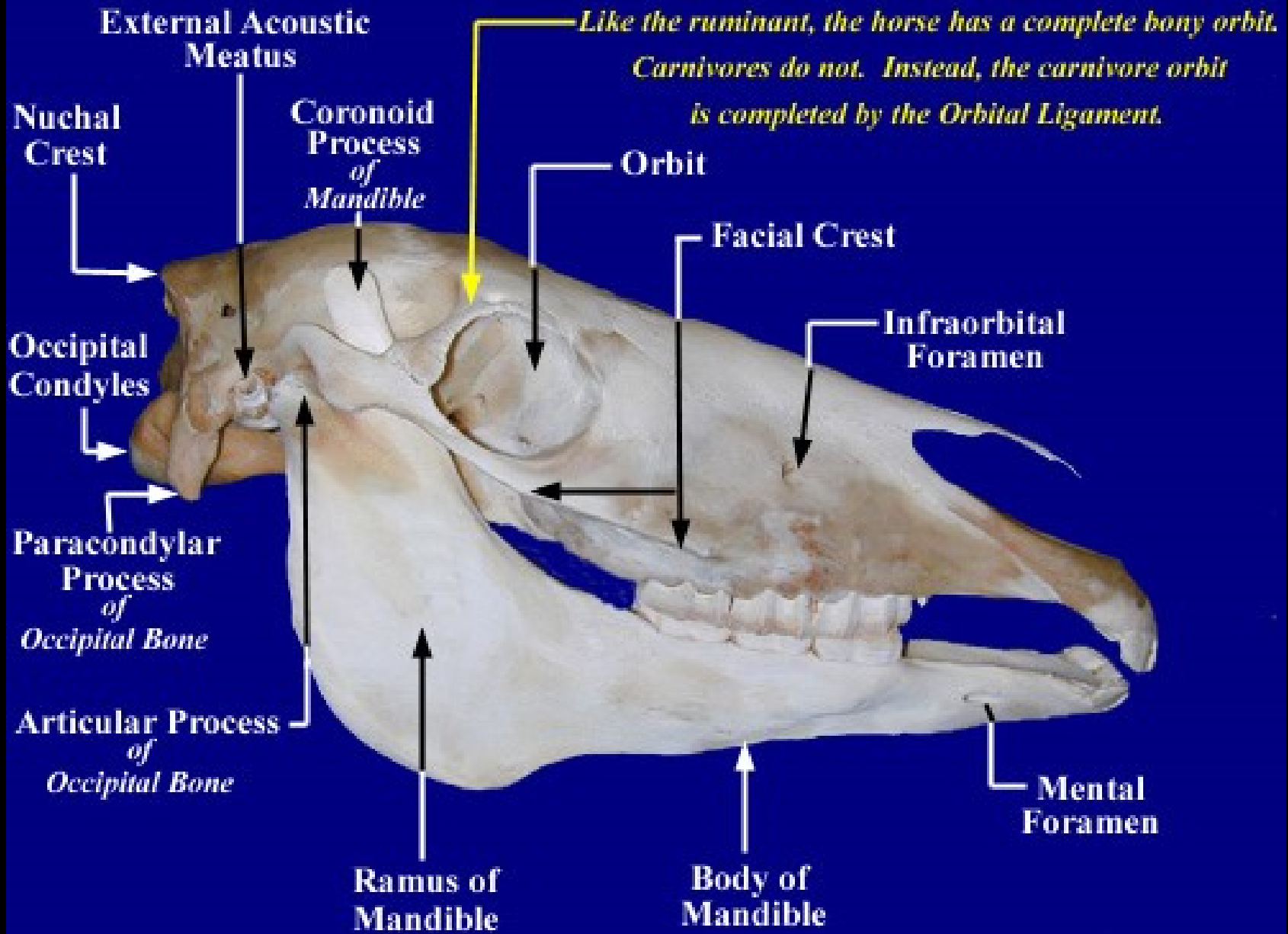


- 1. Facial crest
- 2. Fossa for lacrimal sac
- 3. Zygomatic arch
- 4. Zygomatic process of frontal bone
- 5. Articular tubercle
- 6. Mandibular fossa
- 7. External sagittal crest
- 8. Nuchal crest

- 9. Temporal fossa
- 10. Coronoid process
- 11. External acoustic meatus
- 12. Mastoid process
- 13. Condylod fossa
- 14. Occipital condyle
- 15. Jugular process
- 16. Condylar process

- 17. Mandibular notch
- 18. Ramus of mandible
- 19. Angle of mandible
- 20. Retroarticular process
- 21. Mental foramen
- 22. Nasal process of incisive bone
- 23. Infraorbital foramen
- 24. Nasoincisive notch





External Acoustic Meatus

Like the ruminant, the horse has a complete bony orbit. Carnivores do not. Instead, the carnivore orbit is completed by the Orbital Ligament.

Nuchal Crest

Coronoid Process of Mandible

Orbit

Facial Crest

Occipital Condyles

Infraorbital Foramen

Paracondylar Process of Occipital Bone

Articular Process of Occipital Bone

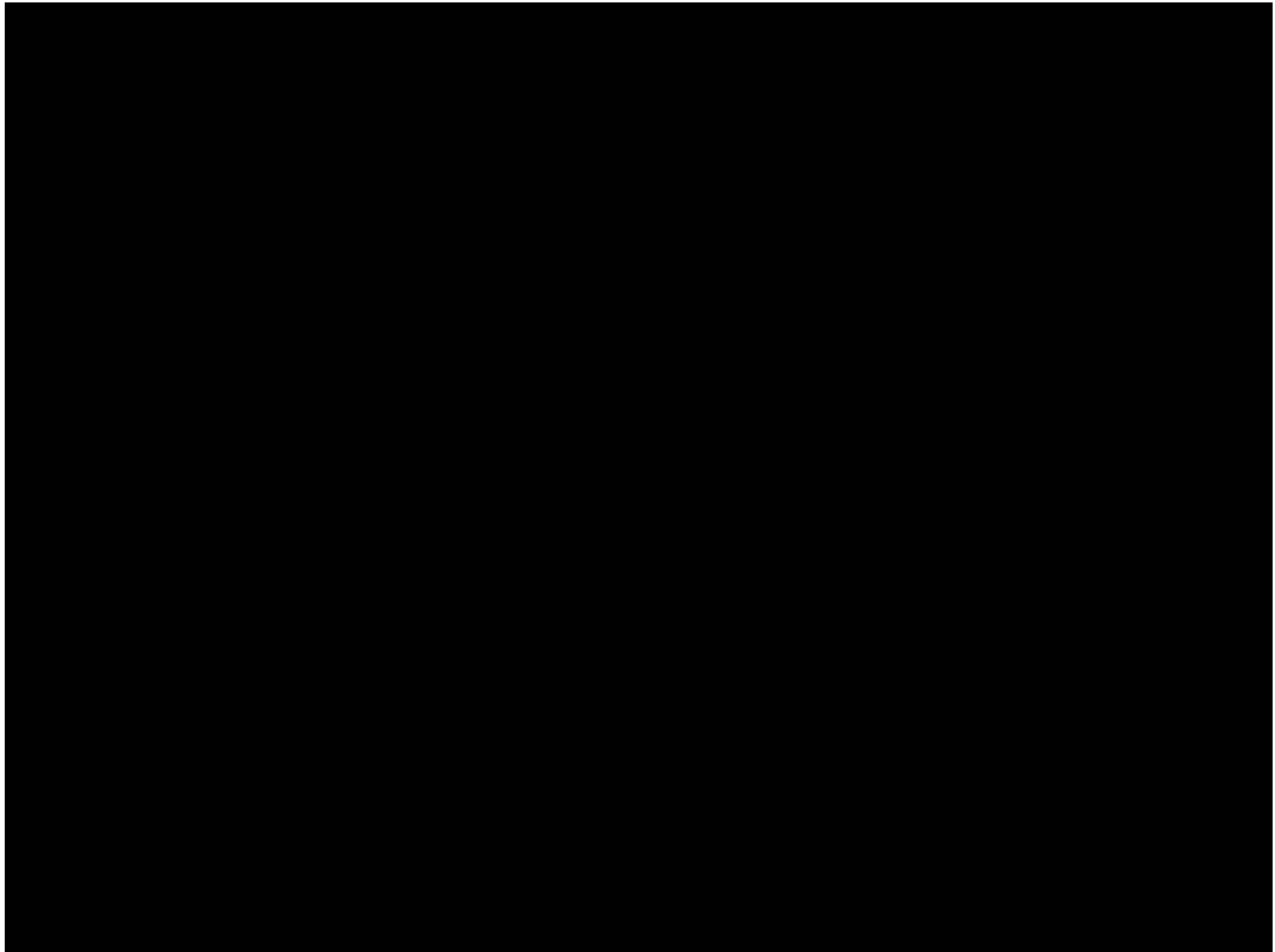
Ramus of Mandible

Body of Mandible

Mental Foramen

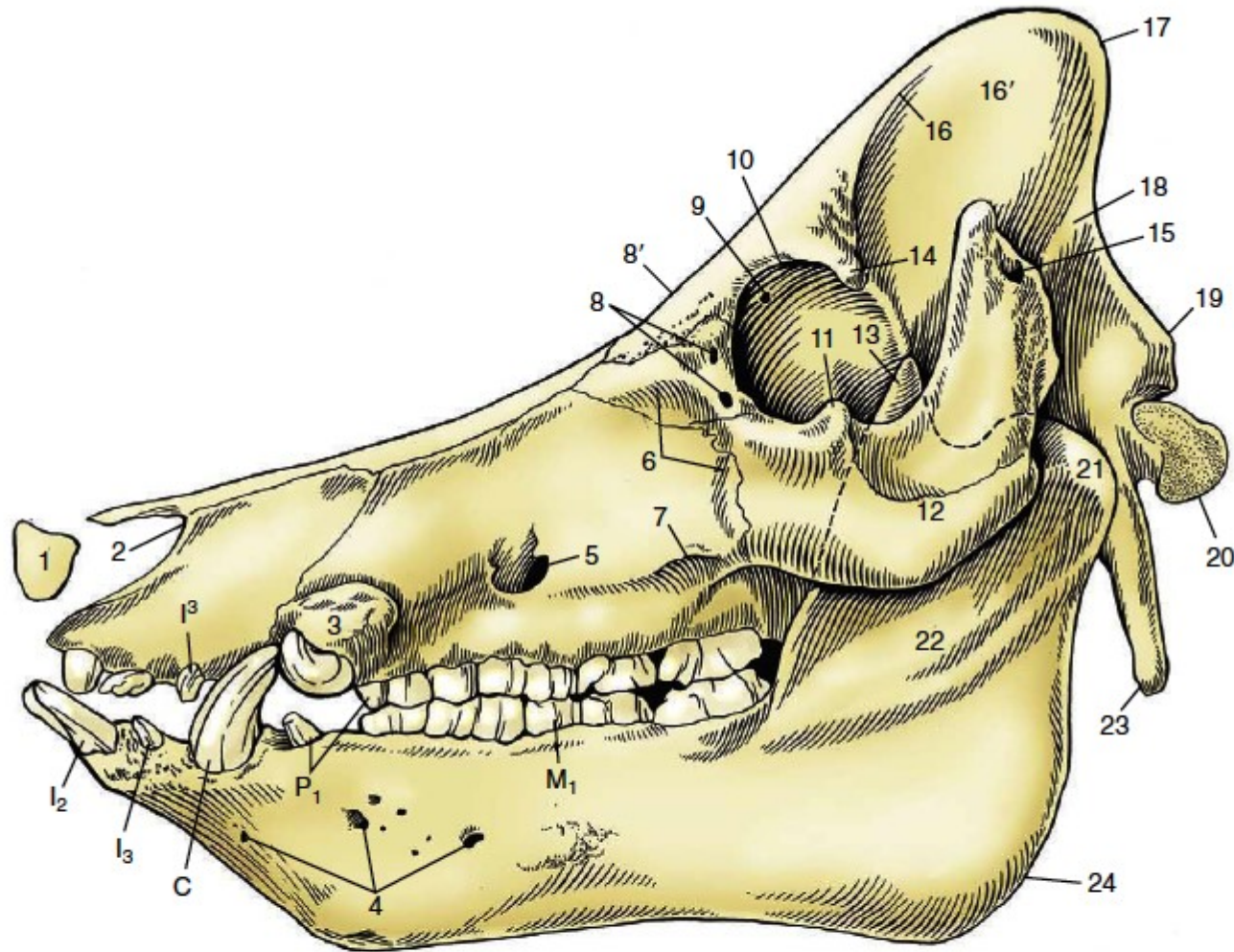
Skull of dog

- Shape of the **skull** varies from breed to breed.
- **Zygomatic process** is highly curved.
- **Inter-parietal** fuse with **occipital** before birth
- **Parietal bone** take part in the formation of the roof of the cranial cavity.
- Orbital rim is **incomplete**.



Skull of Pig

- **Orbital ring** are incomplete.
- Canine teeth are **well developed**.
- **Para-mastoid process** are long and extended downward.
- **Coronoid process** of mandible is short and pointed.
- The angle between the two rami are comparatively wide.
- It has a visceral bone at the rostral aspect of the nasal septal cartilage known as **Os-Rostrale**.
- **Basilar part of occipital bone** is hexagonal in shape and depressed.
- Whole skull is **hexagonal** in shape.



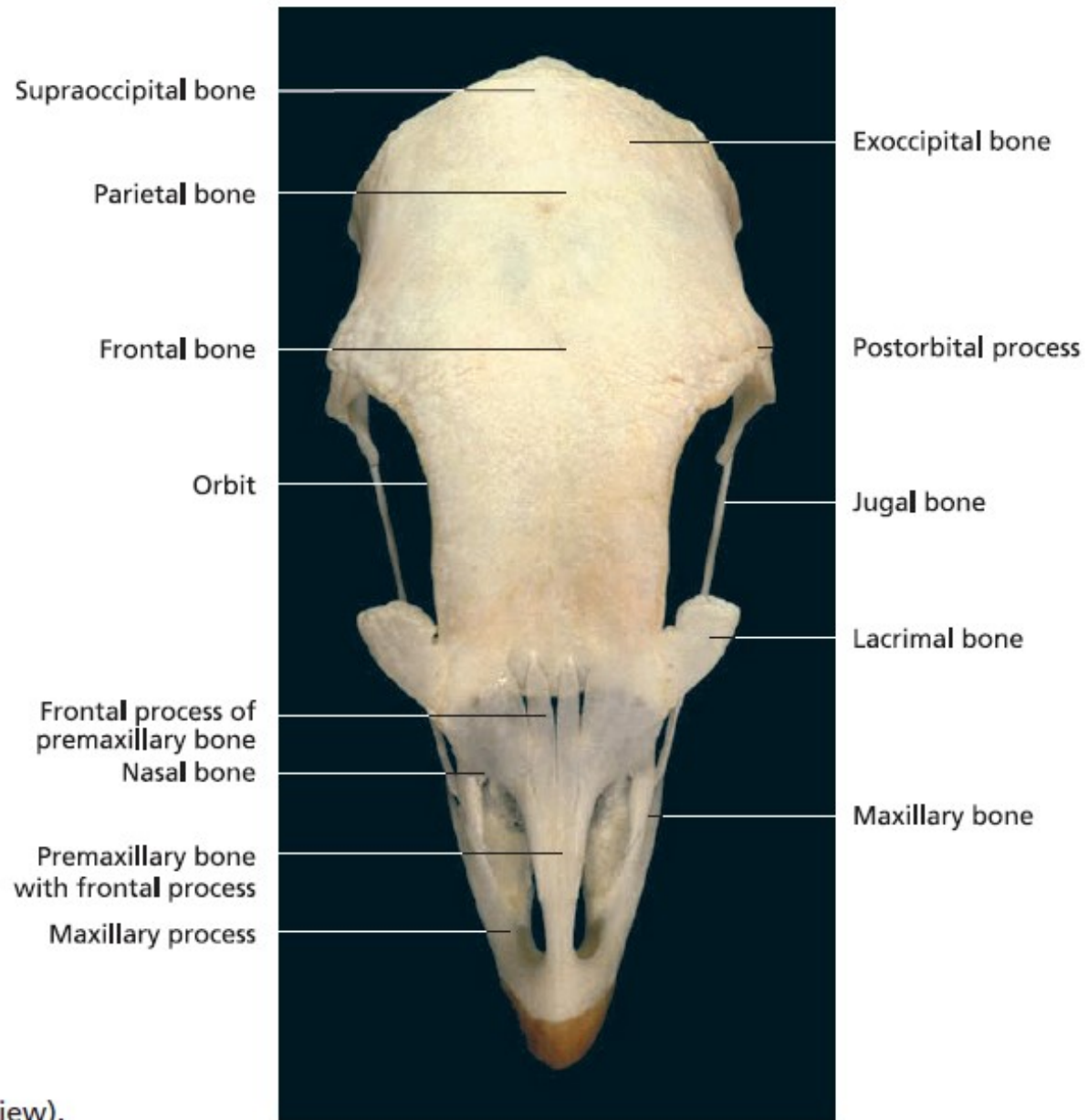
Skull of a boar. 1, Rostral bone; 2, nasoincise notch; 3, canine eminence; 4, lateral mental foramina; 5, infraorbital toramen; 6, tossa canina; 7, facial crest; 8, lacrimal foramina; 8', location of supraorbital foramen on dorsal surface; 9, orbital end of supraorbital canal; 10, orbital rim; 11, frontal process of zygomatic bone; 12, zygomatic arch; 13, coronoid process of mandible; 14, zygomatic process of frontal bone; 15, external acoustic meatus; 16, temporal line; 16', temporal fossa; 17, nuchal crest; 18, temporal crest; 19, nuchal tubercle; 20, occipital condyle; 21, condylar process of mandible; 22, ramus of mandible; 23, paracondylar process; 24, angle of mandible; I₂, I₃, I³, incisors; C, canine teeth (tusks); P₁, first premolars; M₁, first molar.

SKULL OF PIG

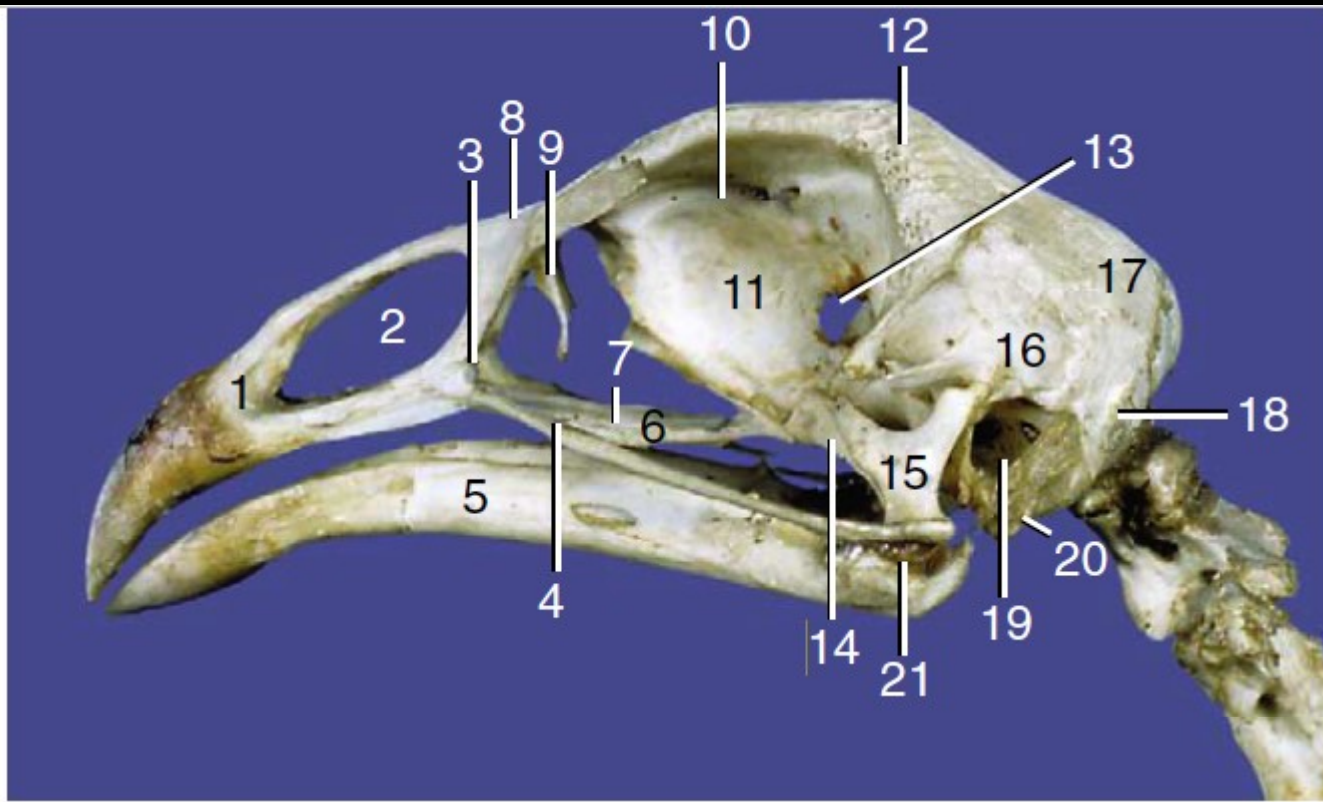


Skull of fowl

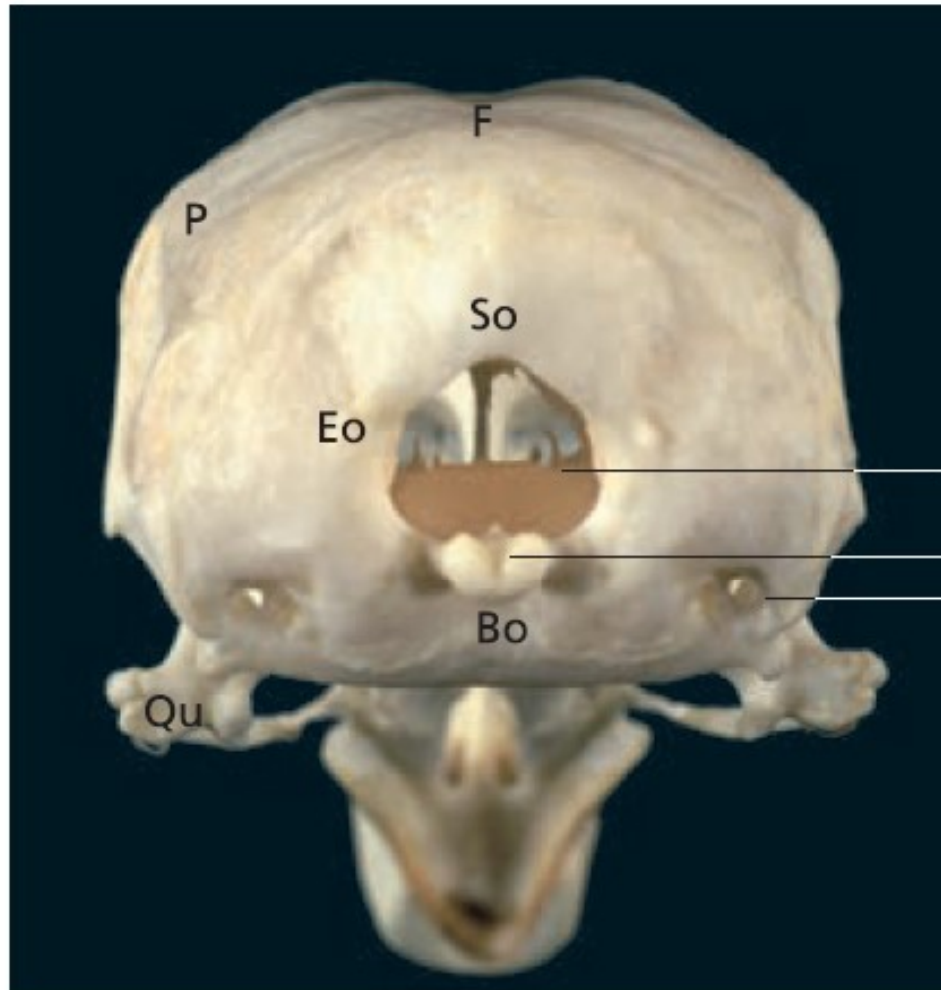
- In case of birds most of the bones are fused.
- In fowl upper jaw is movable due to presence of naso-frontal hinge.
- Orbit is large.
- Occipital condyle is single.
- Teeth are absent in jaw



Skull of a chicken (dorsal view).



Skull of chicken. 1, Premaxilla; 2, nasal aperture; 3, maxilla; 4, jugal arch; 5, mandible; 6, palatine bone; 7, vomer; 8, nasal bone; 9, lacrimal bone; 10, orbit; 11, interorbital septum; 12, frontal bone; 13, optic foramen; 14, pterygoid bone; 15, quadrate bone; 16, temporal bone; 17, parietal bone; 18, occipital bone; 19, tympanic cavity with cochlear and vestibular windows; 20, sphenoid bone; 21, articular bone.



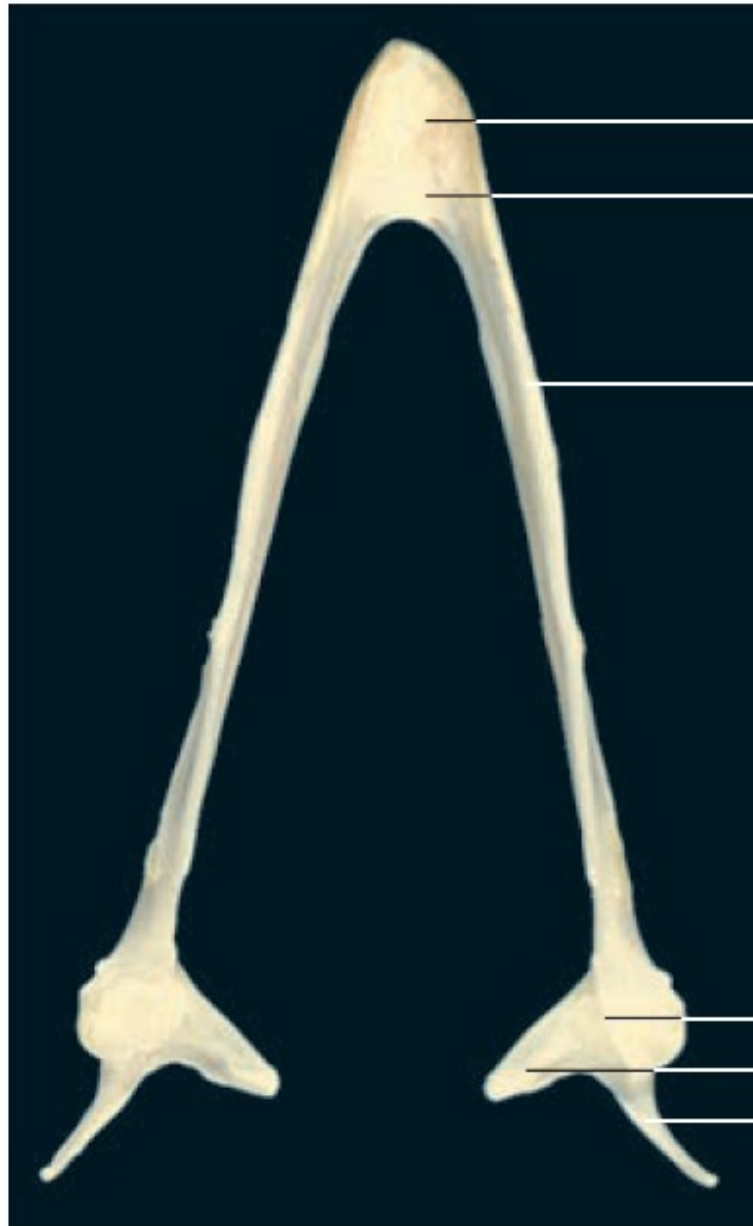
- Bo Basioccipital bone
- Eo Exoccipital bone
- F Frontal bone
- P Parietal bone
- Qu Quadrate bone
- So Supraoccipital bone

Foramen magnum

Occipital condyle

Parabasal fossa

Skull of a chicken (caudal view).

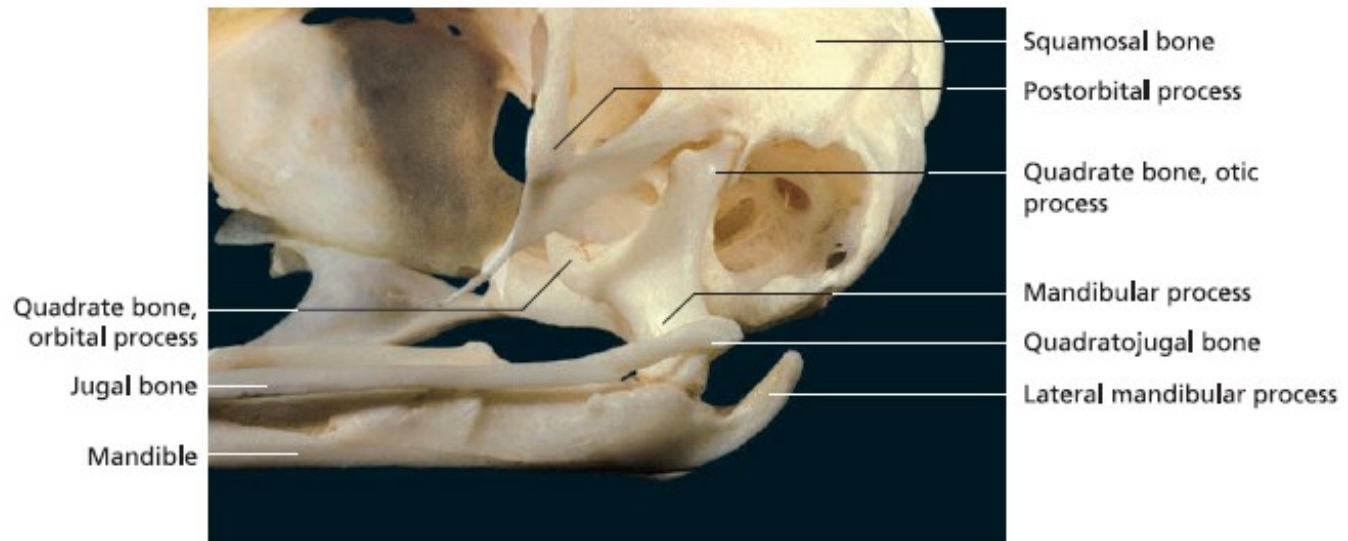


Rostrum mandibulae
Mandibular symphysis

Tomial crest

Quadrato articular fossa
Medial process
Lateral process

Mandible of a chicken (dorsal view).



Closed mandibular joint of a chicken (left lateral view).



Open mandibular joint of a chicken (left lateral view).

Thank you