Introduction

MAMMALOGY 2019

Expectations for Today

- You will be expected to be able to:
  - Read and write scientific names
  - Draw cladograms
  - Identify the bones of the skull
  - Identify the bones of the body
  - Calculate the formulae for teeth patterns
  - Identify occlusal patterns

Phylogenetics

Phylogenetics – the study of evolutionary relationships among taxa

Taxa – the individual groups of species (order, family, genus are all taxa)

Cladogram – a branching diagram showing the relationships between taxa

Kingdom: Animalia

Phylum: Chordata

Class: Mammalia

Order: Lagomorpha

Family: Leporidae

Genus: *Sylvilagus*

Species: *floridanus*

Taxonomic Rankings

Domain
Eukarya

Kingdom
Animalia

Phylum
Chordata

Class
Mammalia

Order
Carnivora

Family
Canidae

Genus
Vulpes

Species
vulpes

Taxonomic Rankings

Scientific Nomenclature

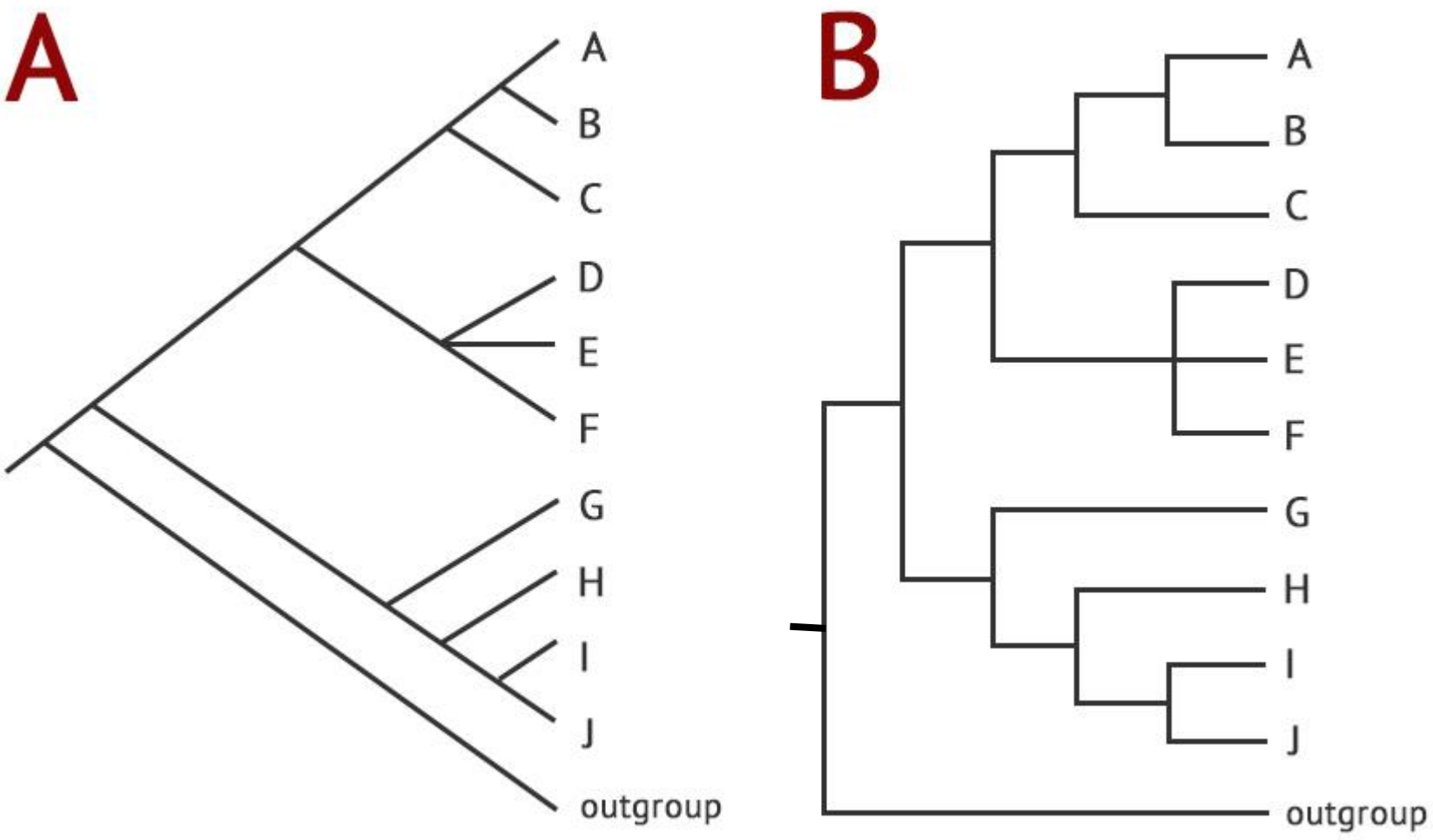
- Orders and Families: first letter capitalized
  - In Class Mammalia, most Orders end in “a”
  - Most Families end in “idae”

- Genus and Species
  - Genus is capitalized
  - species is not capitalized
  - Genus and species need to be written in *italics* or <u>underlined</u>
  - When only keyed to genus, followed by “spp.”

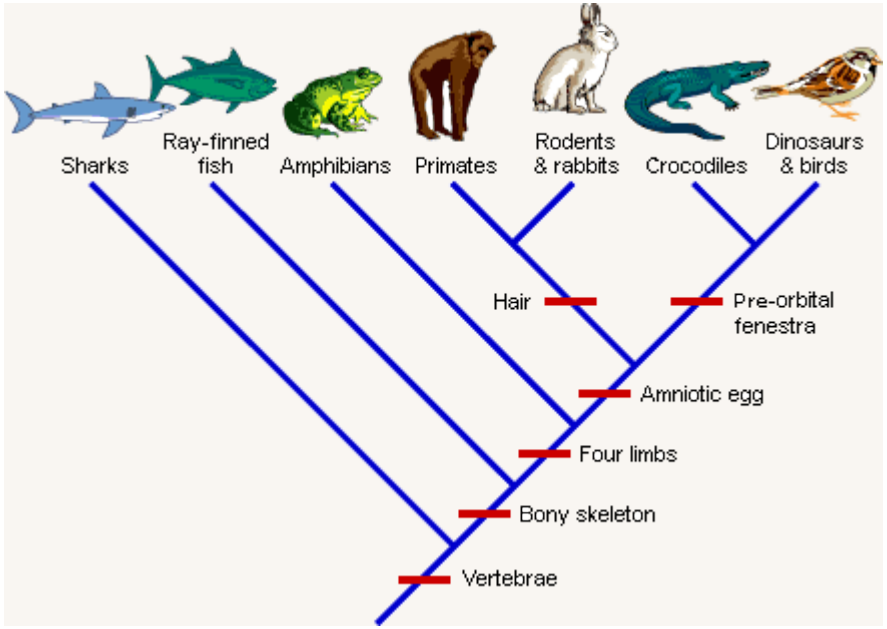
Scientific Nomenclature

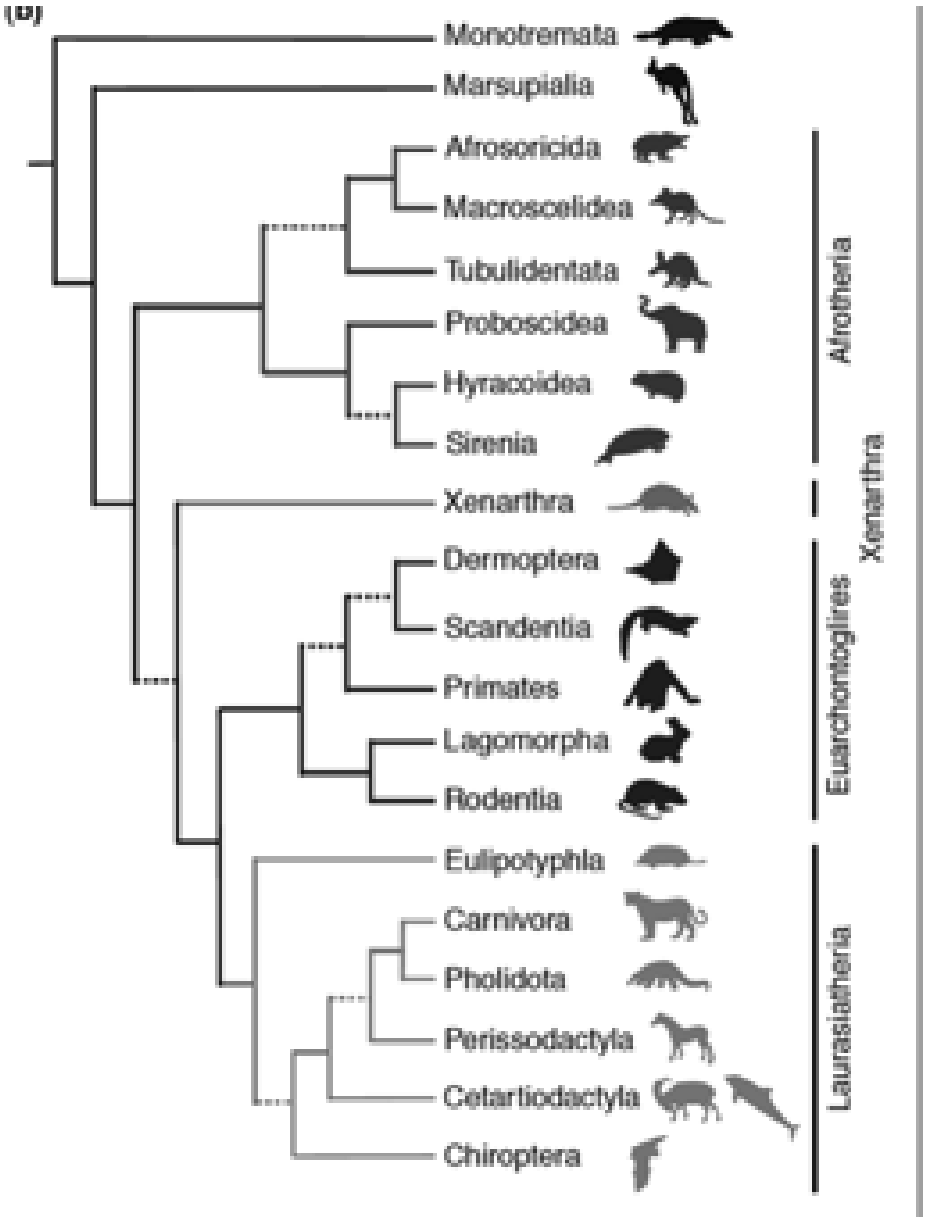
- A. Homo sapiens
- B. Homo sapiens
- C. Homo Sapiens
- D. *homo sapiens*
- E. homo *sapiens*
- F. Homo Sapiens
- G. *Homo sapiens*
- H. *Homo sapiens*
- I. *homo sapiens*
- J. Homo sapiens
- K. Homo Sapiens
- L. *Homo* spp.

Cladograms



Cladograms


Sharks
Ray-finned fish
Amphibians
Primates
Rodents & rabbits
Crocodiles
Dinosaurs & birds
Hair
Pre-orbital fenestra
Amniotic egg
Four limbs
Bony skeleton
Vertebrae


(b)
Monotremata
Marsupialia
Afrosoricida
Macroscelidea
Tubulidentata
Proboscidea
Hyracoidea
Sirenia
Xenarthra
Dermoptera
Scandentia
Primates
Lagomorpha
Rodentia
Eulipotyphla
Carnivora
Pholidota
Perissodactyla
Cetartiodactyla
Chiroptera
Afrotheria
Euarchontoglires
Laurasiatheria
Xenarthra

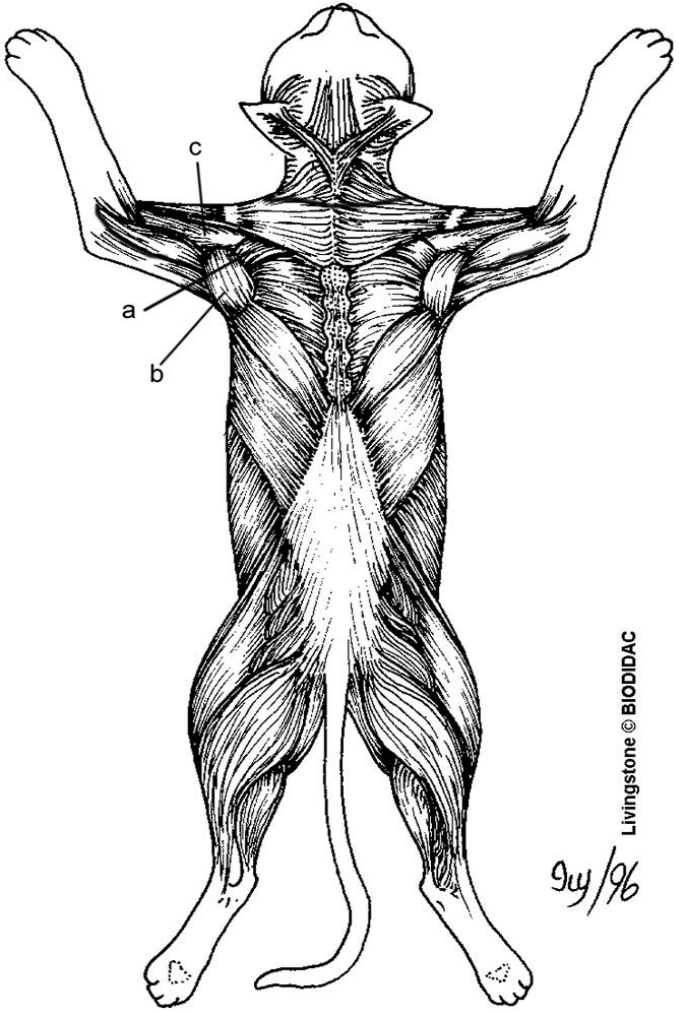
Behavioral Key Terms

- Nocturnal – when an animal is active at night
- Diurnal – when an animal is active during the day
- Crepuscular – when an animal is active during twilight
- Migratory – an animal that moves from one region to another when seasons change
- Monogamous – both the male and female have only one mate
- Polygamous – both the male and female have multiple mates
- Polygynous – only the male has multiple mates
- Polyandrous – only the female has multiple mates

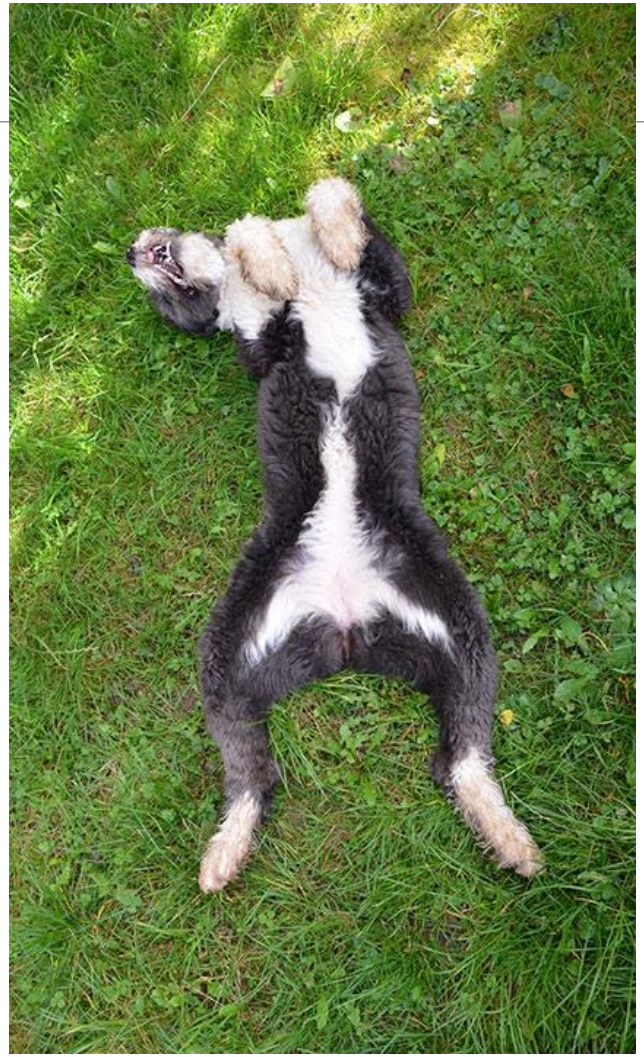
Anatomical Directions

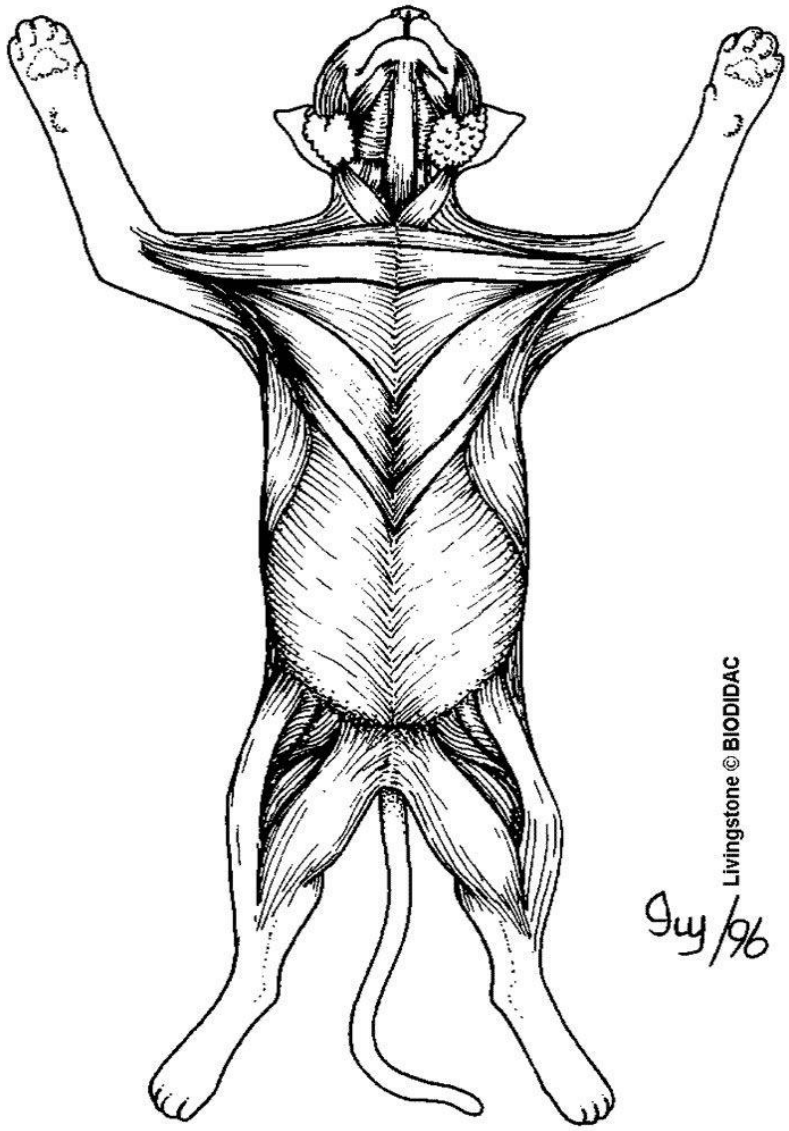
- Dorsal – top of animal
- Ventral – underside of animal
- Anterior – towards the head or snout
- Posterior – towards the rear
- Lateral – left or right side of animal
- Proximal – point at which appendage joins the body
- Distal – extremity of appendage

Dorsal View

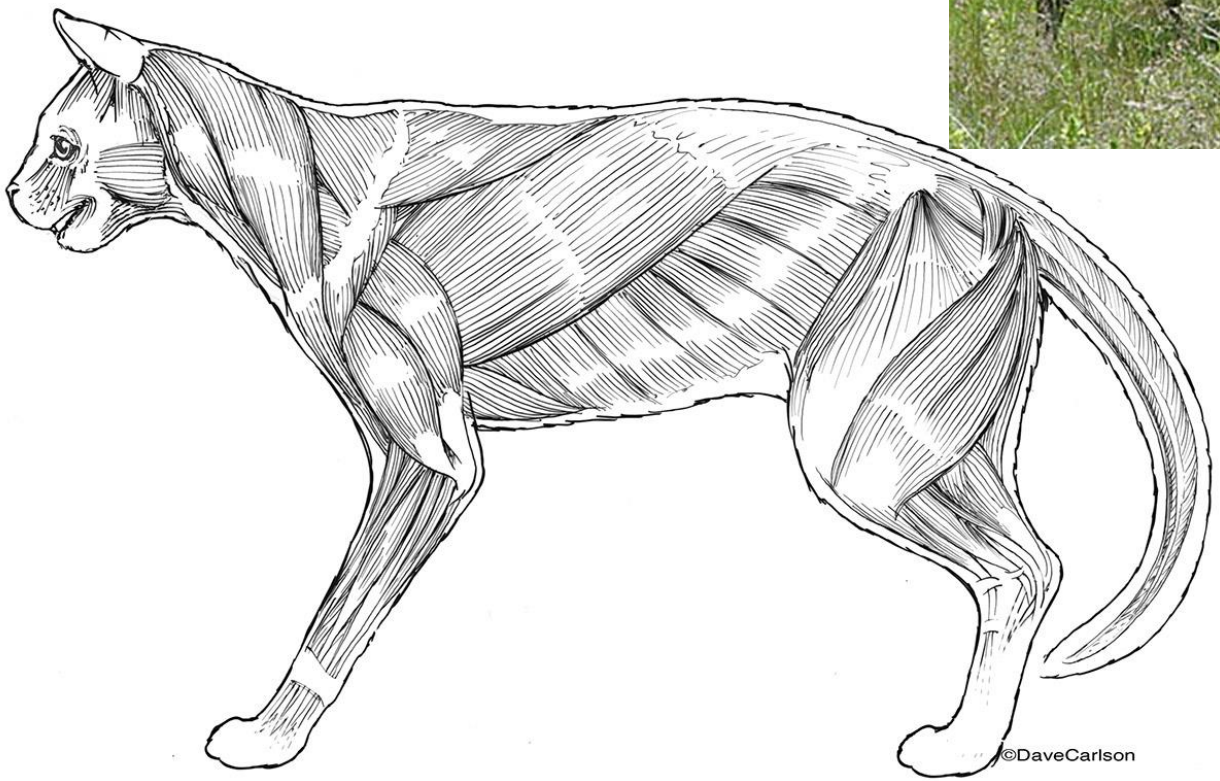


Ventral View





Lateral View



Skeletons

MAMMALOGY 2019

The Skeleton

Cranial

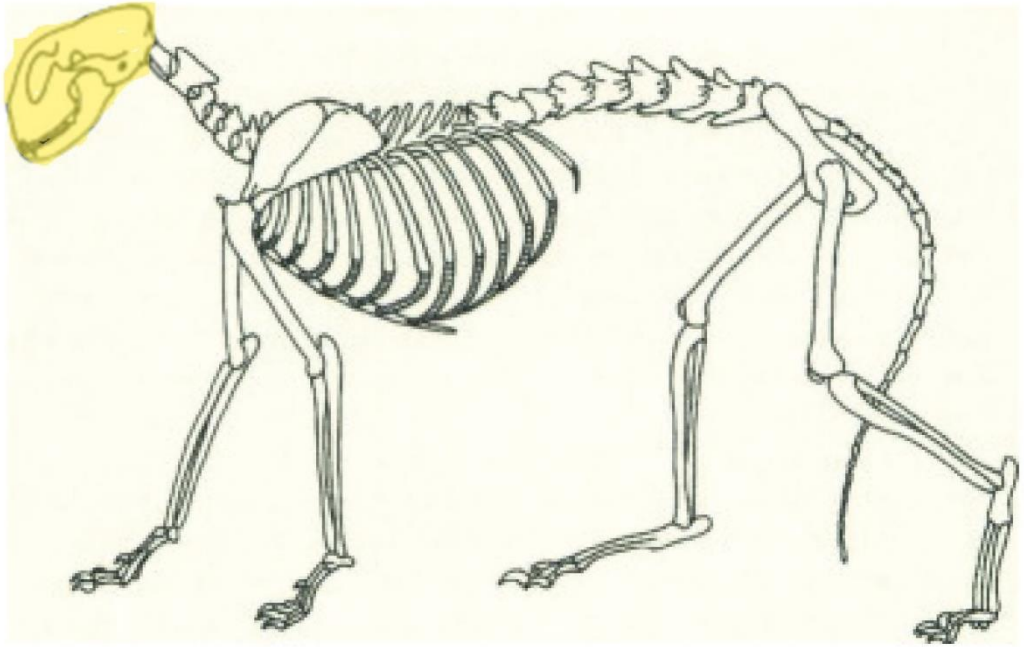


Figure 6.1.
A cat skeleton.

The Skeleton

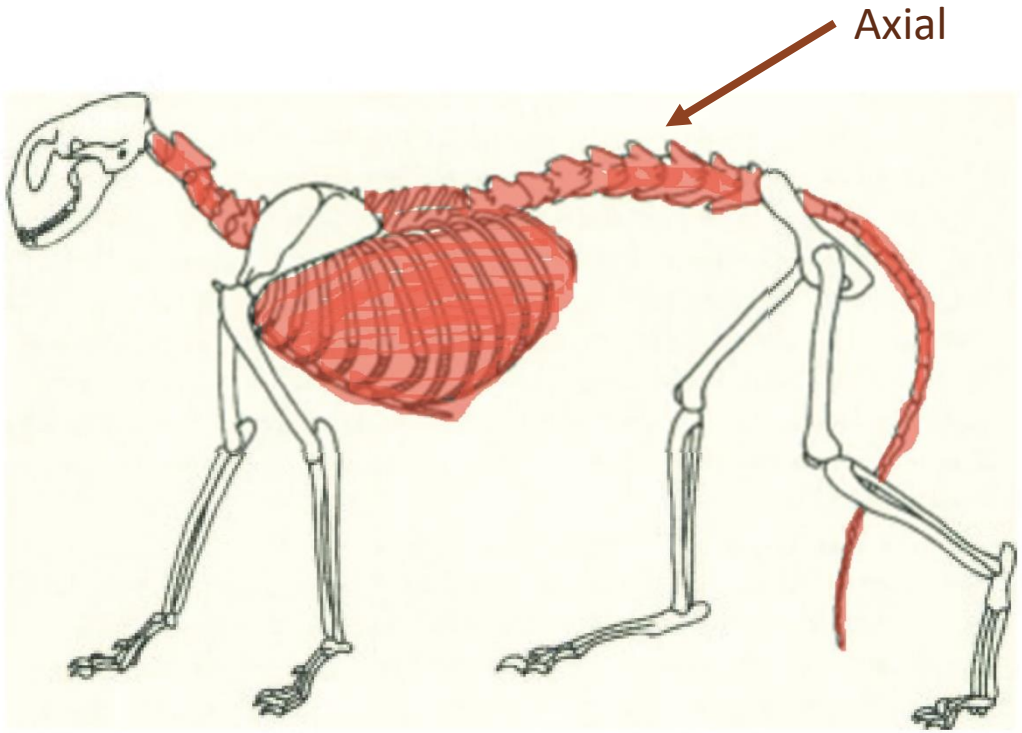


Figure 6.1.
A cat skeleton.

The Skeleton

Appendicular

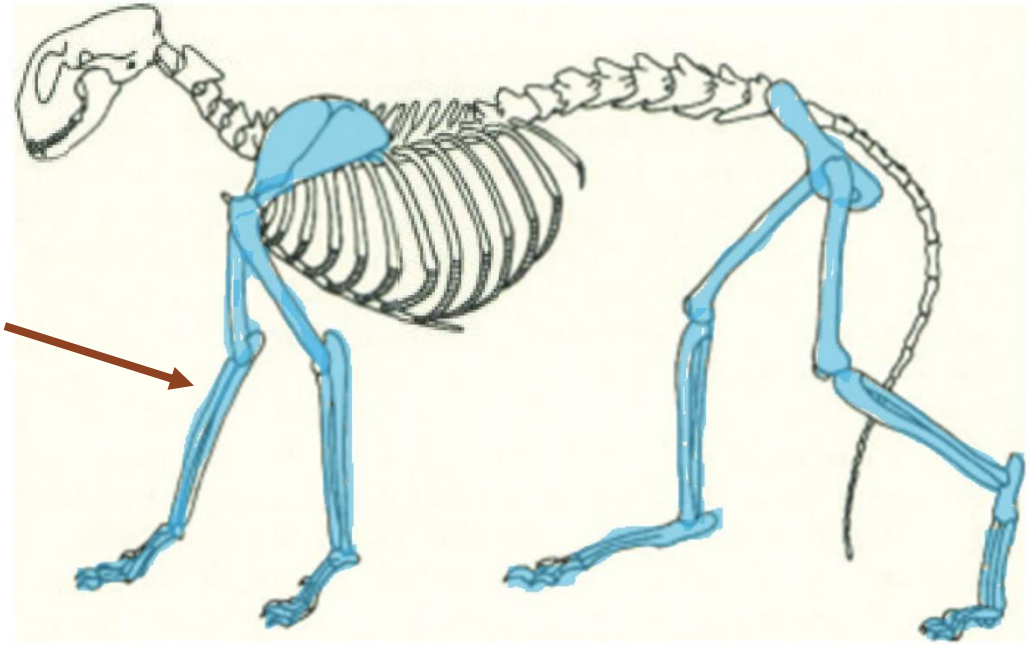
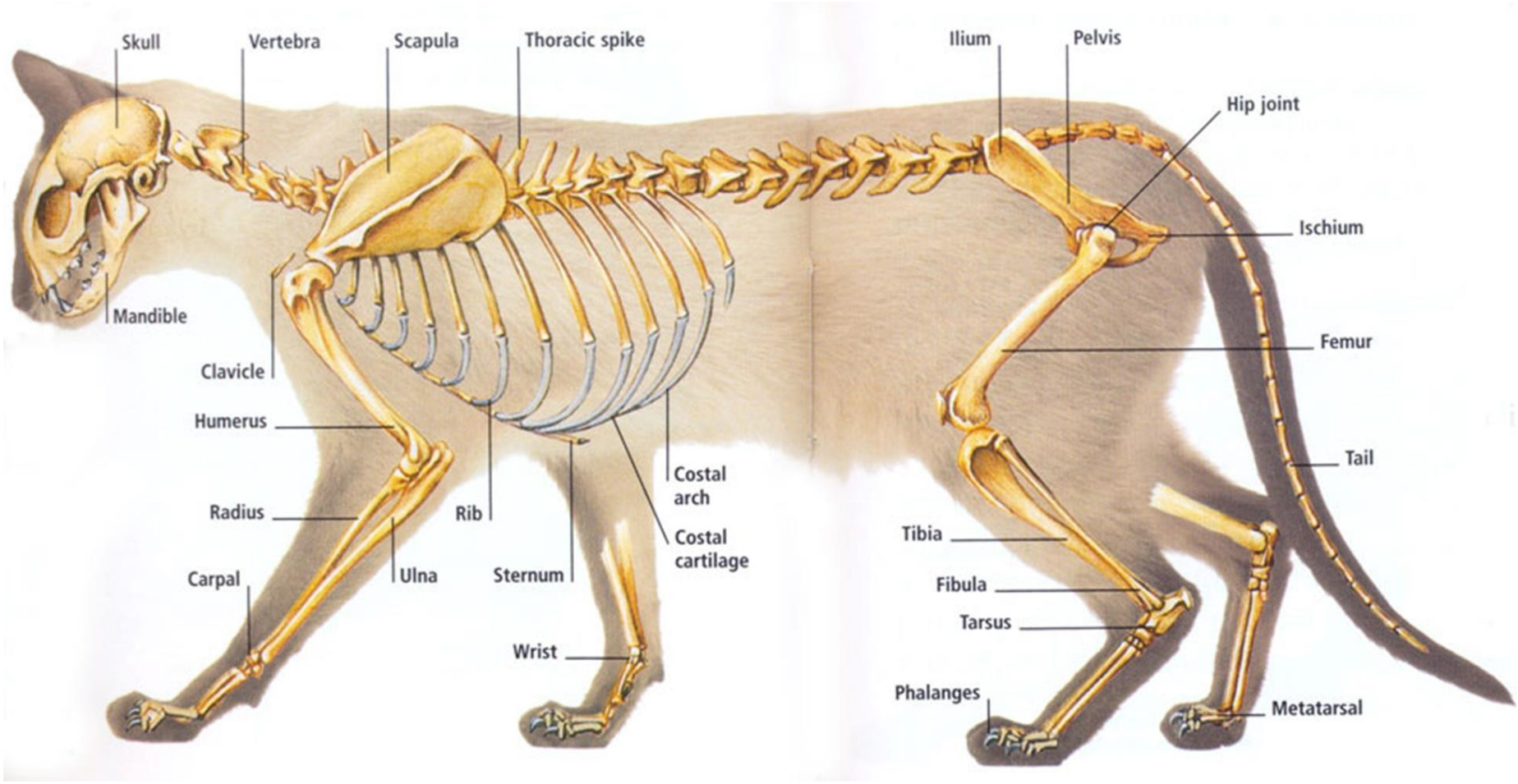


Figure 6.1.
A cat skeleton.


Skull
Vertebra
Scapula
Thoracic spike
Ilium
Pelvis
Hip joint
Ischium
Mandible
Clavicle
Humerus
Femur
Tail
Radius
Rib
Costal arch
Costal cartilage
Tibia
Carpal
Ulna
Sternum
Fibula
Tarsus
Wrist
Phalanges
Metatarsal

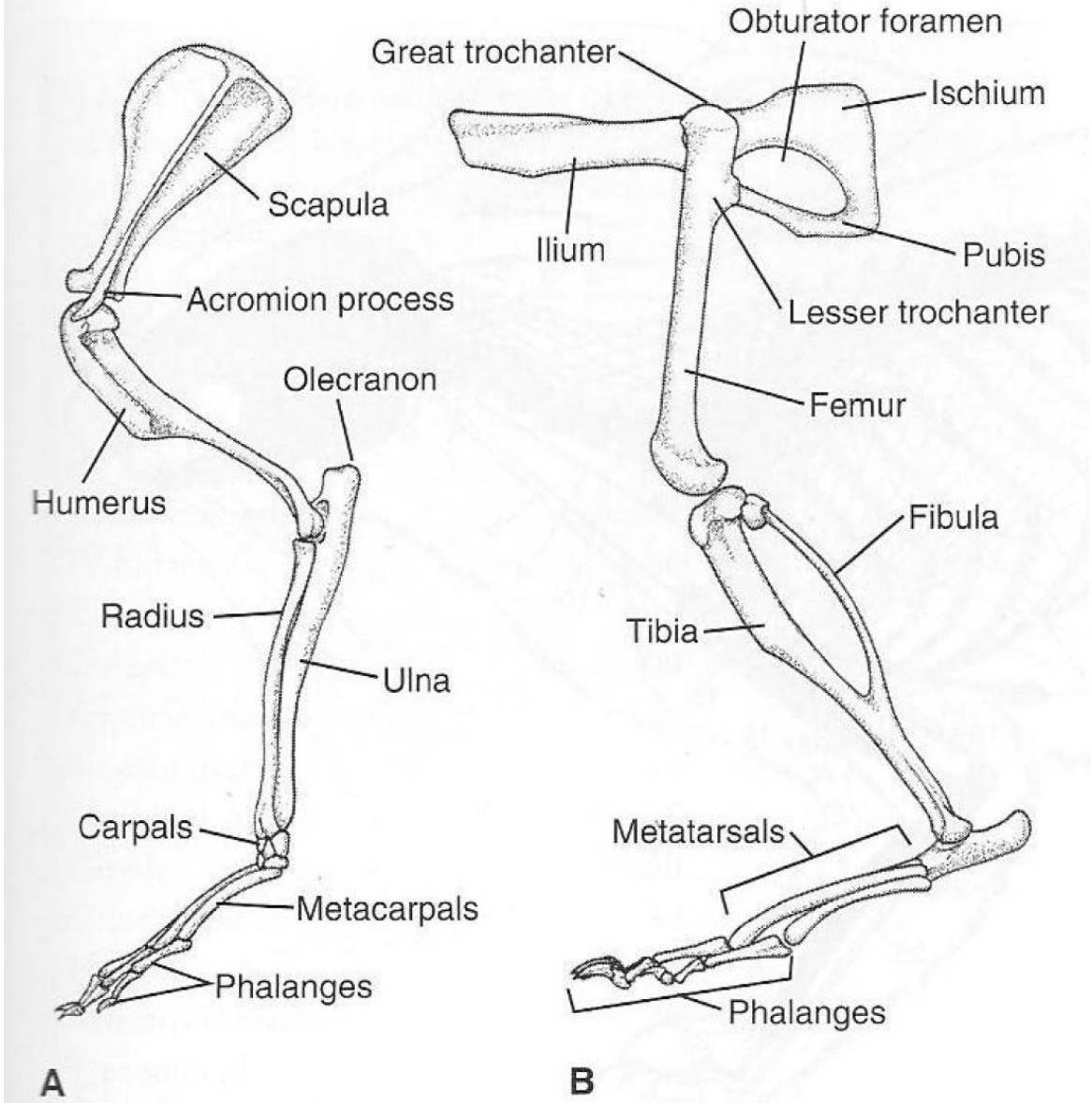
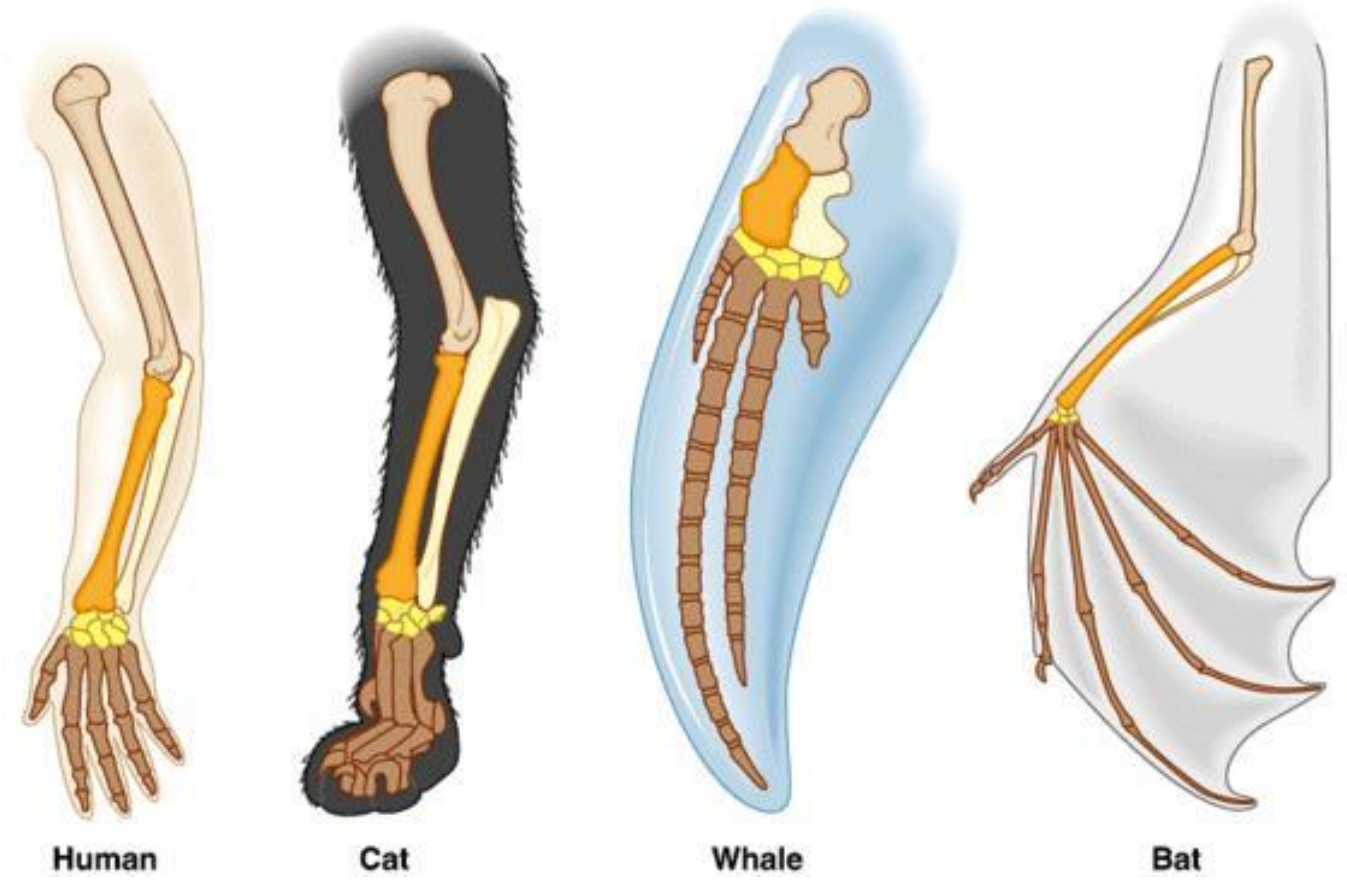
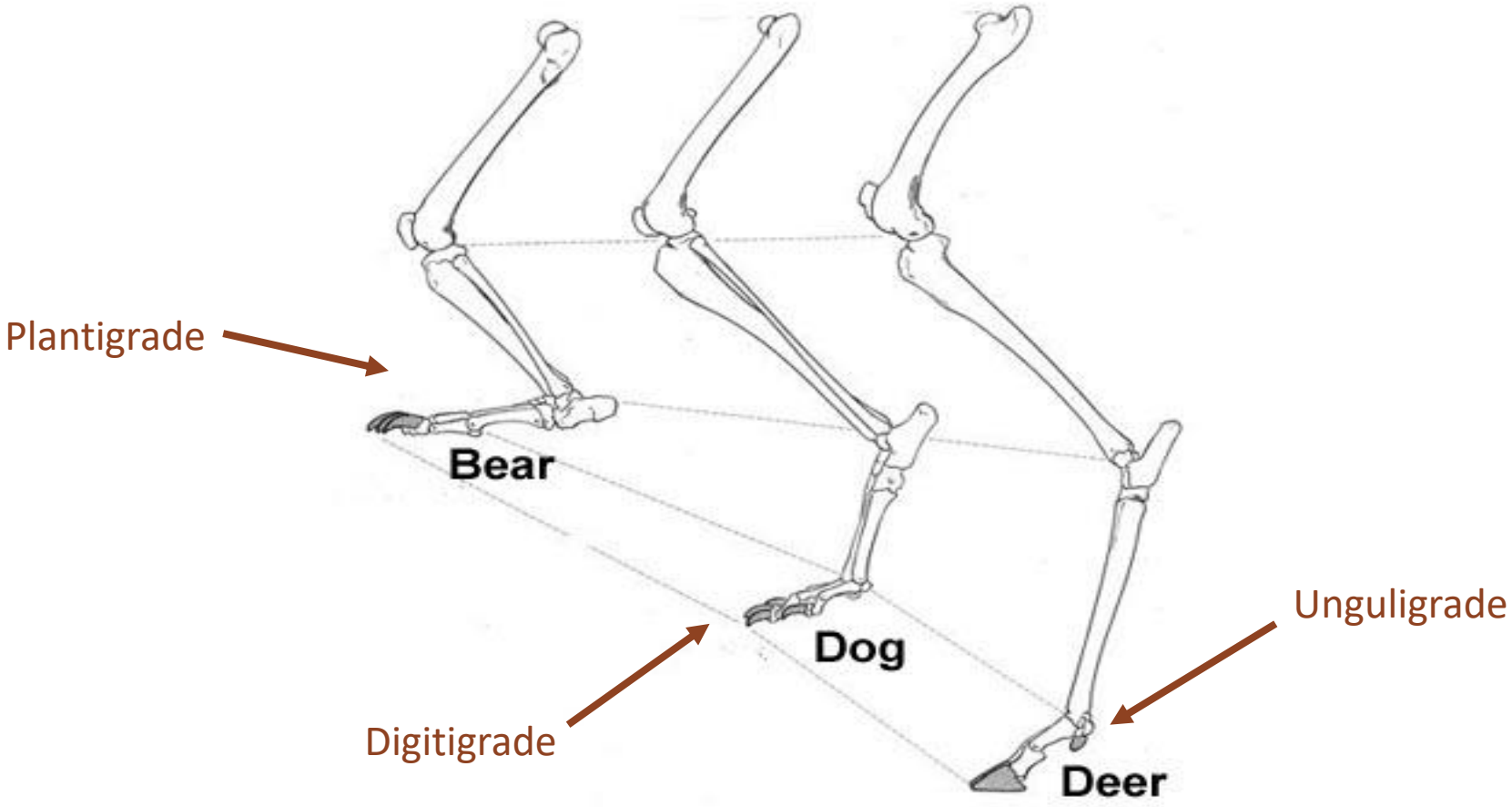


Figure 5.10 **Pectoral and pelvic girdles.** The bone patterns of (A) the pectoral and (B) pelvic girdles and the forelimbs and hind limbs for the Norway rat (*Rattus norvegicus*). Each in-

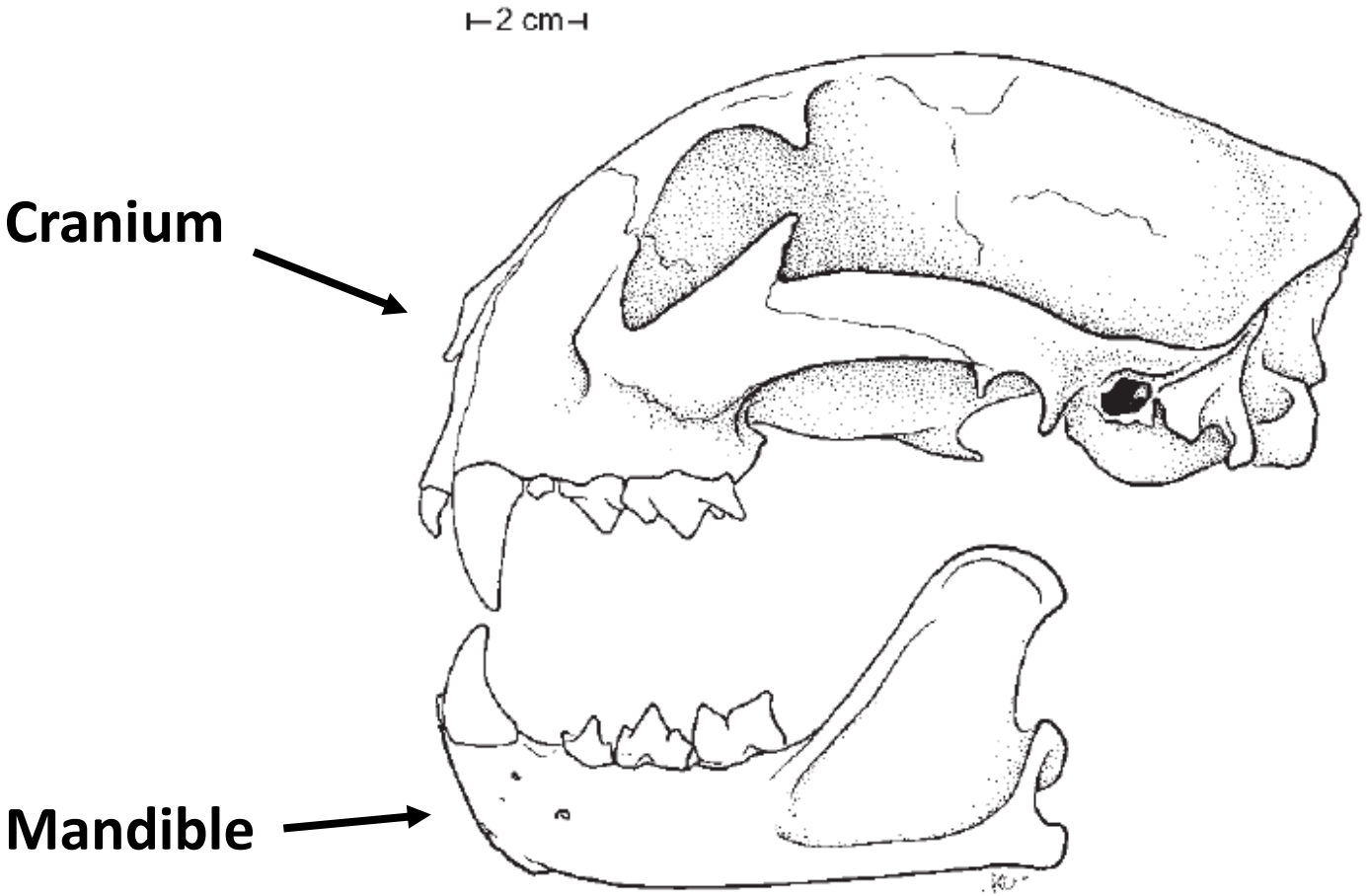
Modified Limbs



Position of Feet



Skull Basics



Mountain lion skull from Trani et al. 2007. Land Manager's Guide to Mammals of the South. Pp. 457

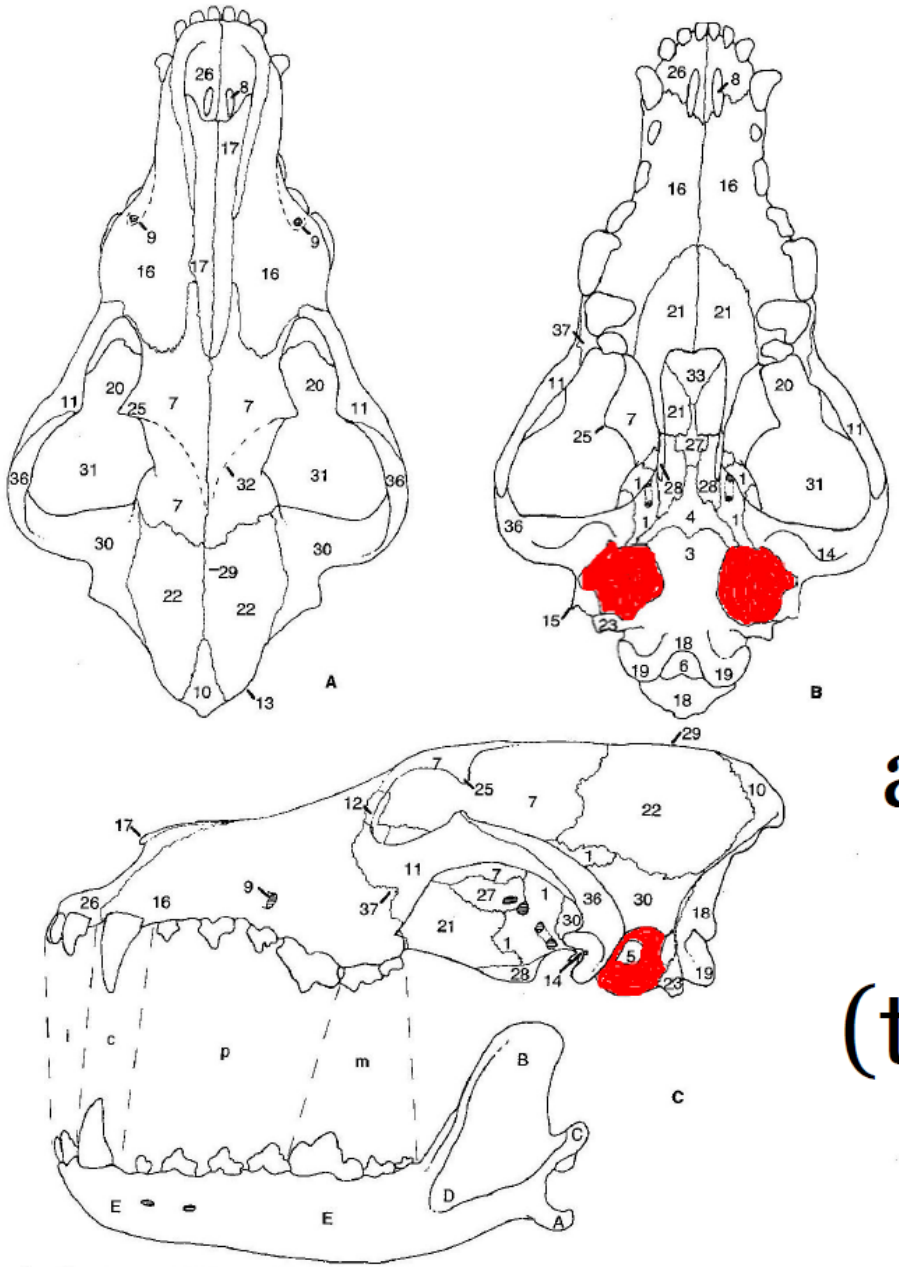
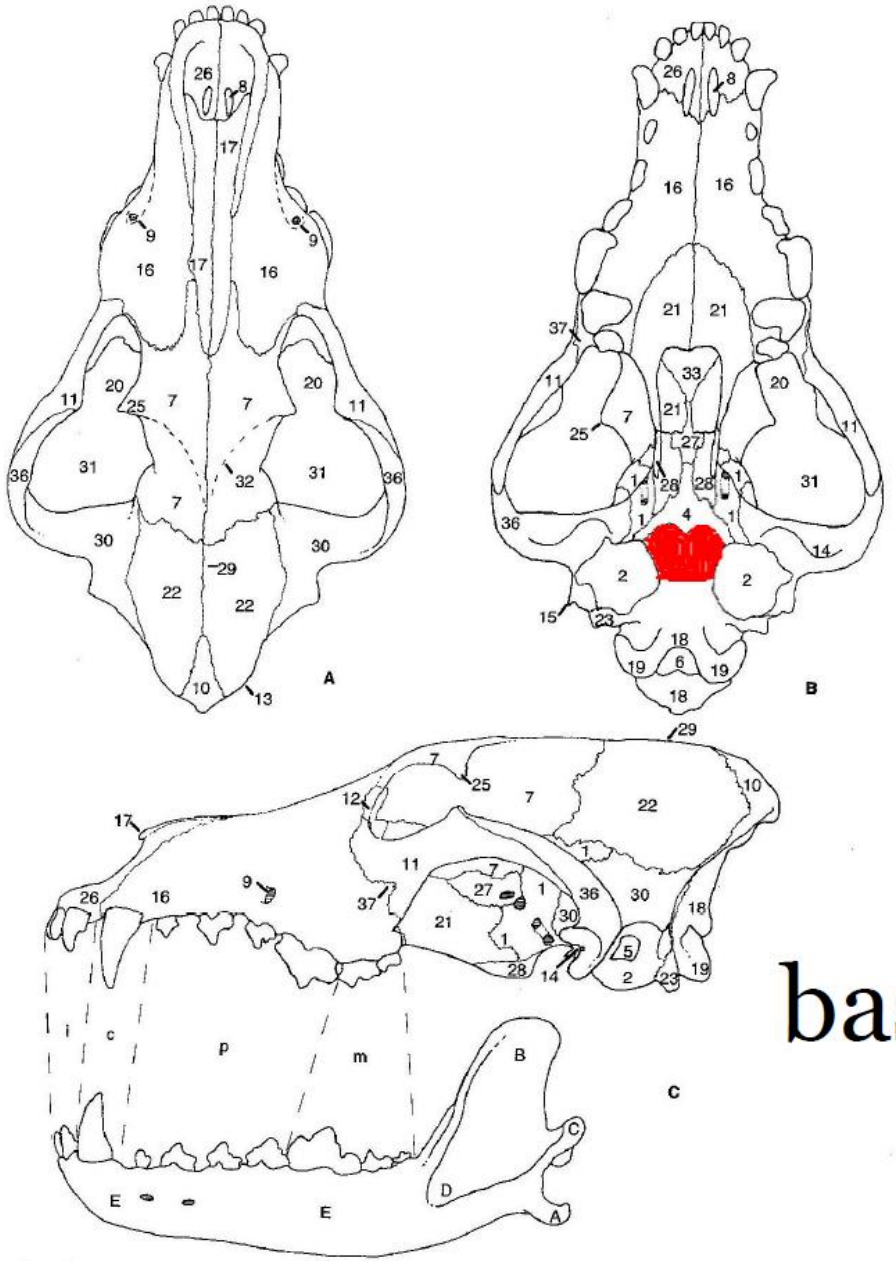


Fig. 1. Cranium and left mandible of Canis A, dorsal view; B, ventral view; C, left lateral view. See page 7 for key to features (modified after DeBlase and Martin, 1981).

auditory bulla (tympanic bone)



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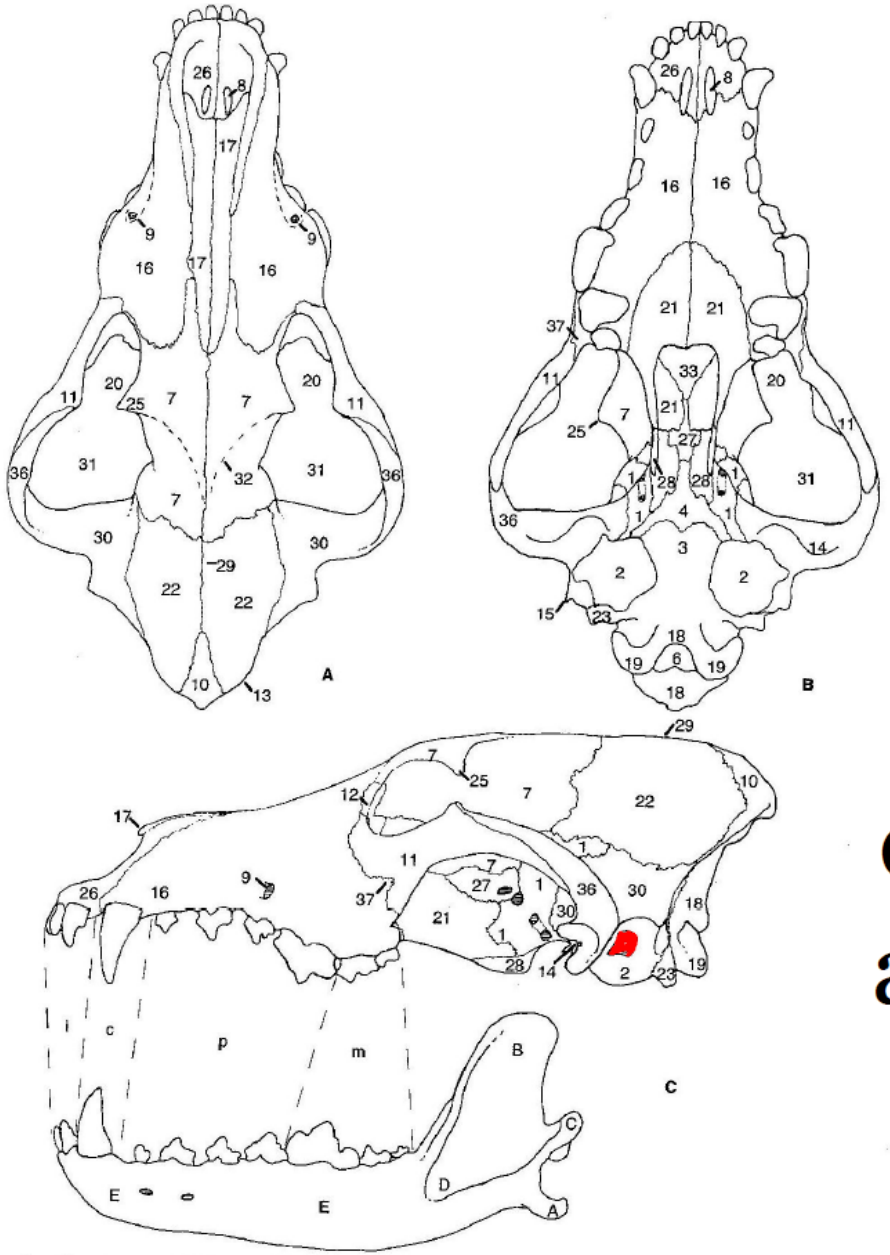

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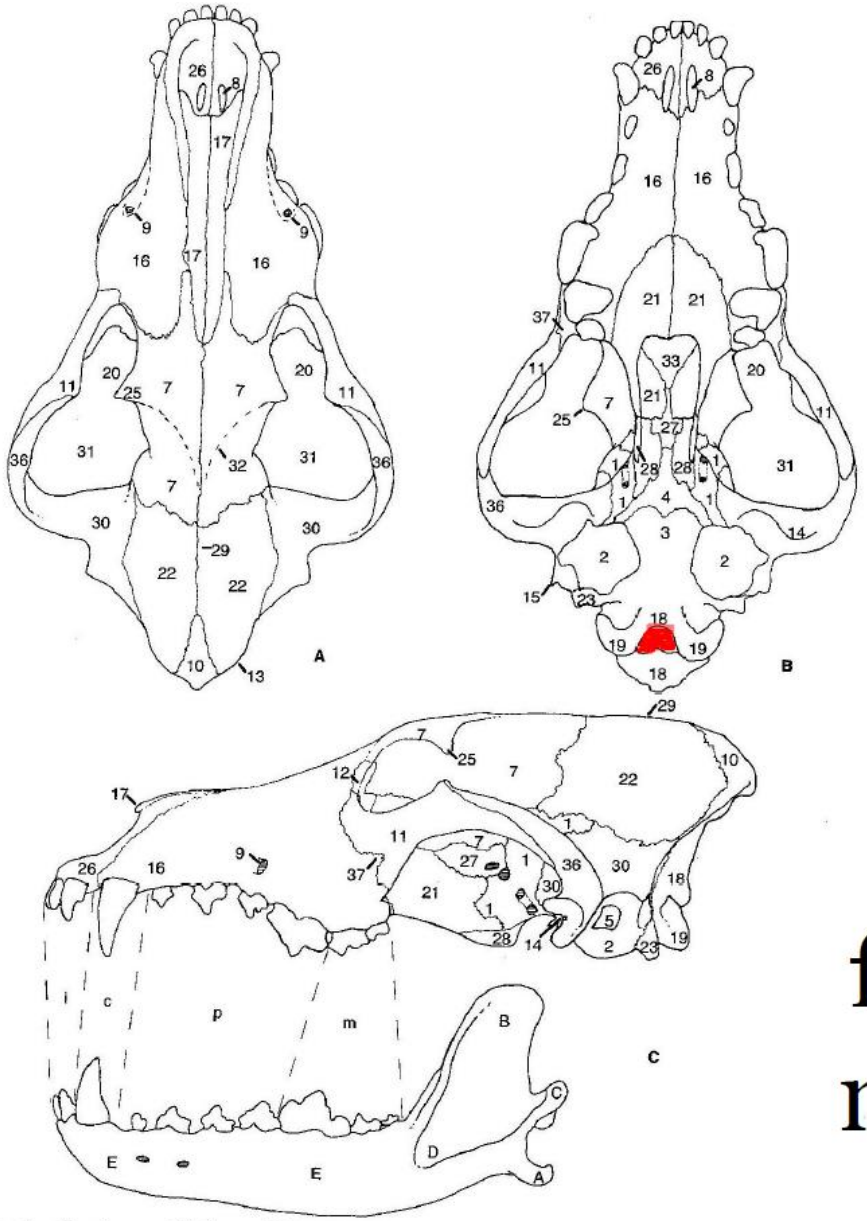
external auditory meatus



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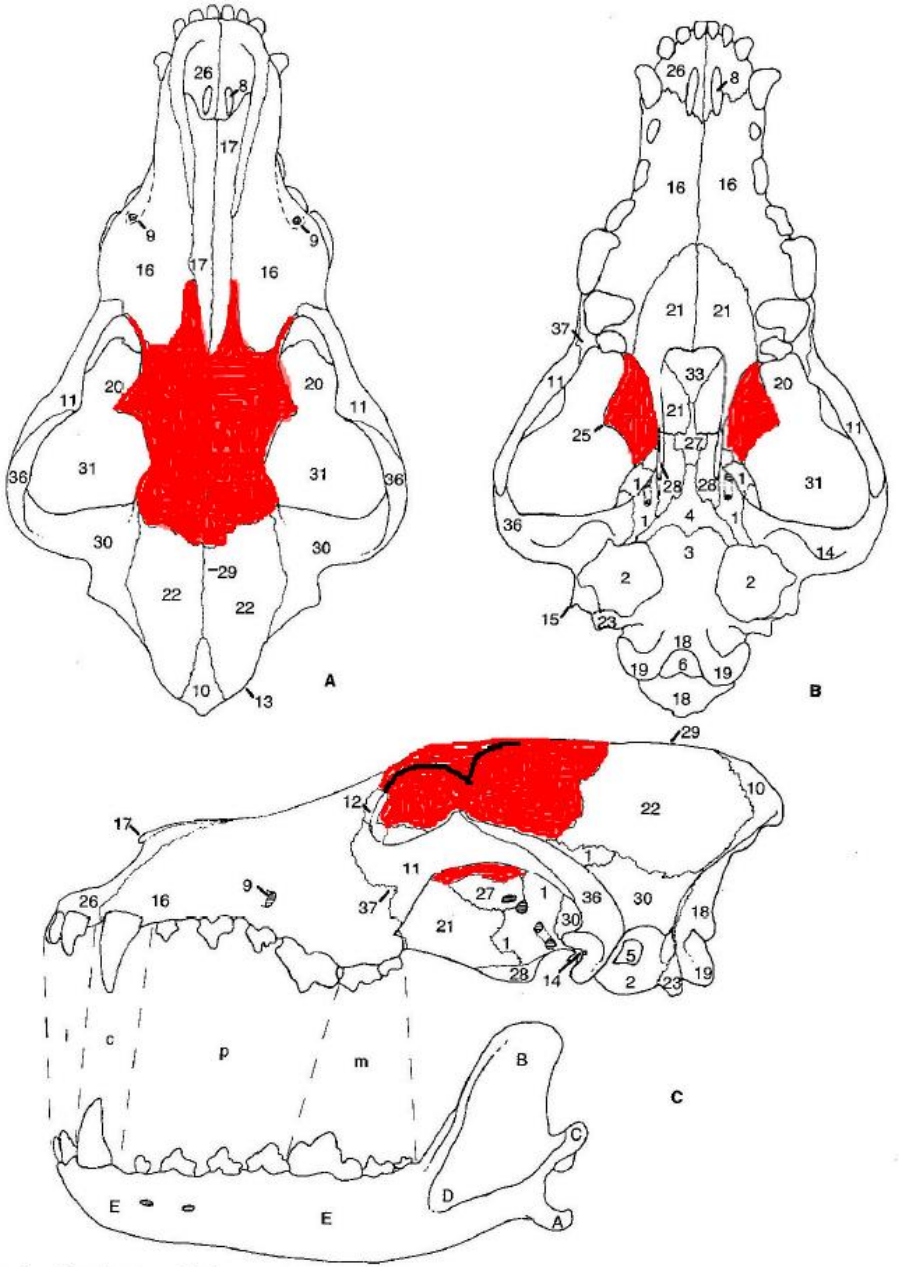
foramen magnum



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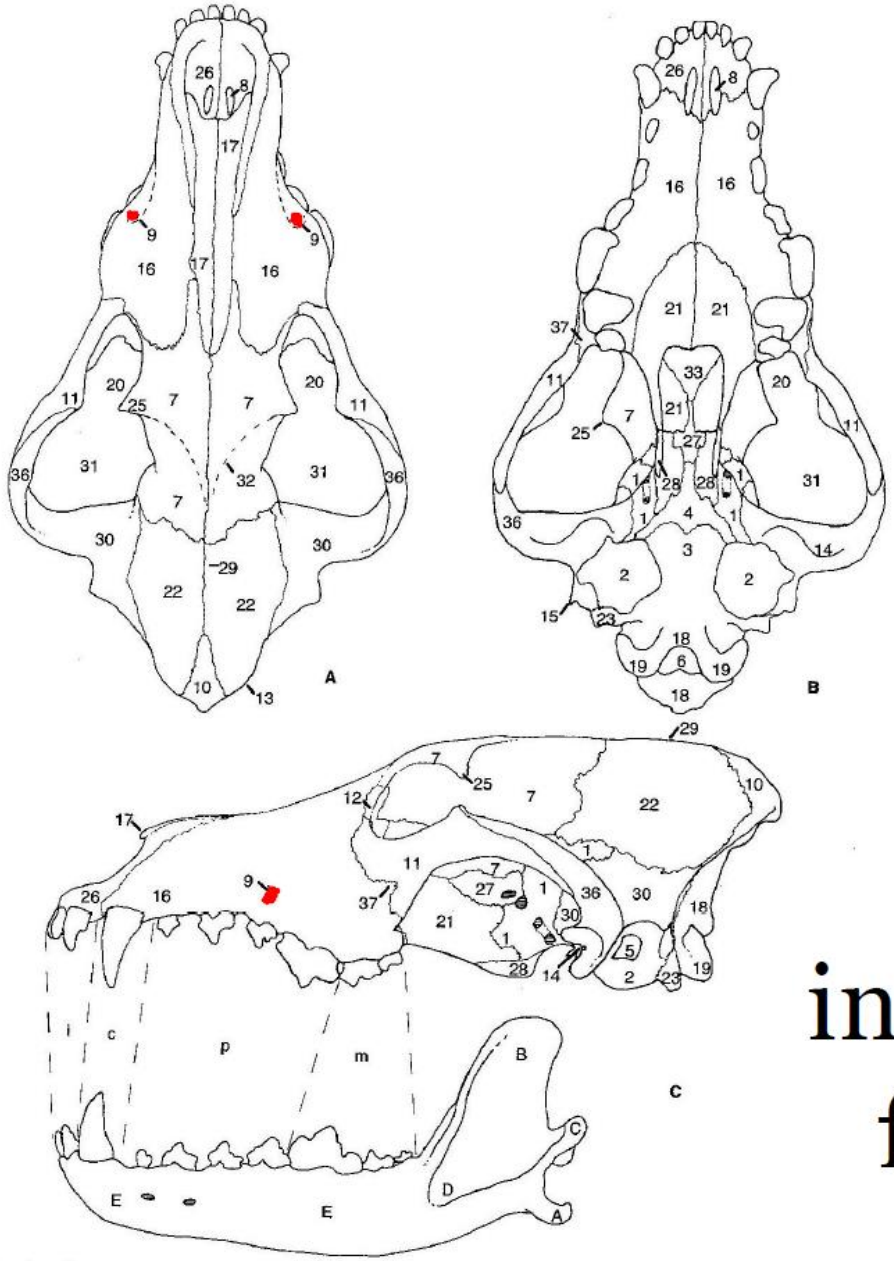
Parts of the Skull



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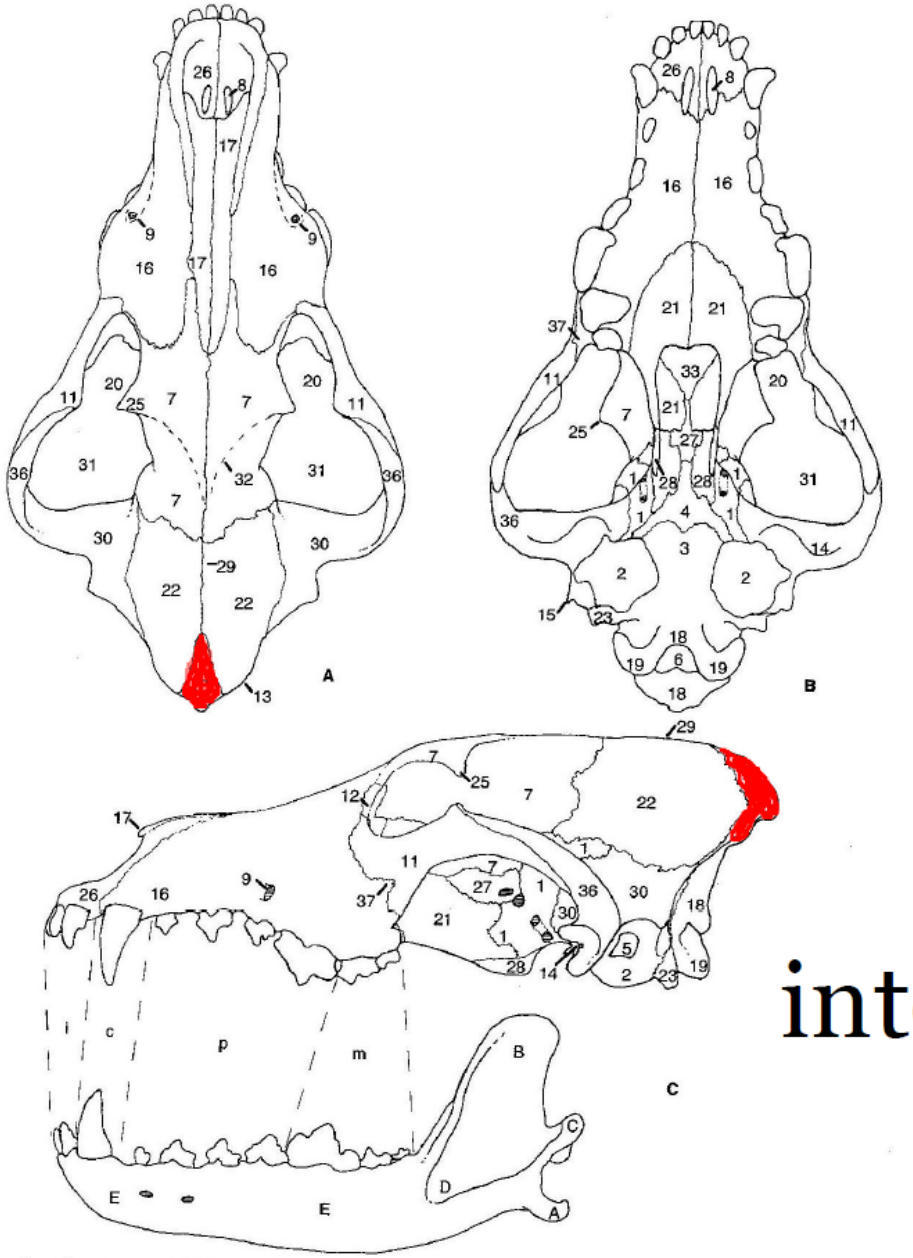
infraorbital foramen



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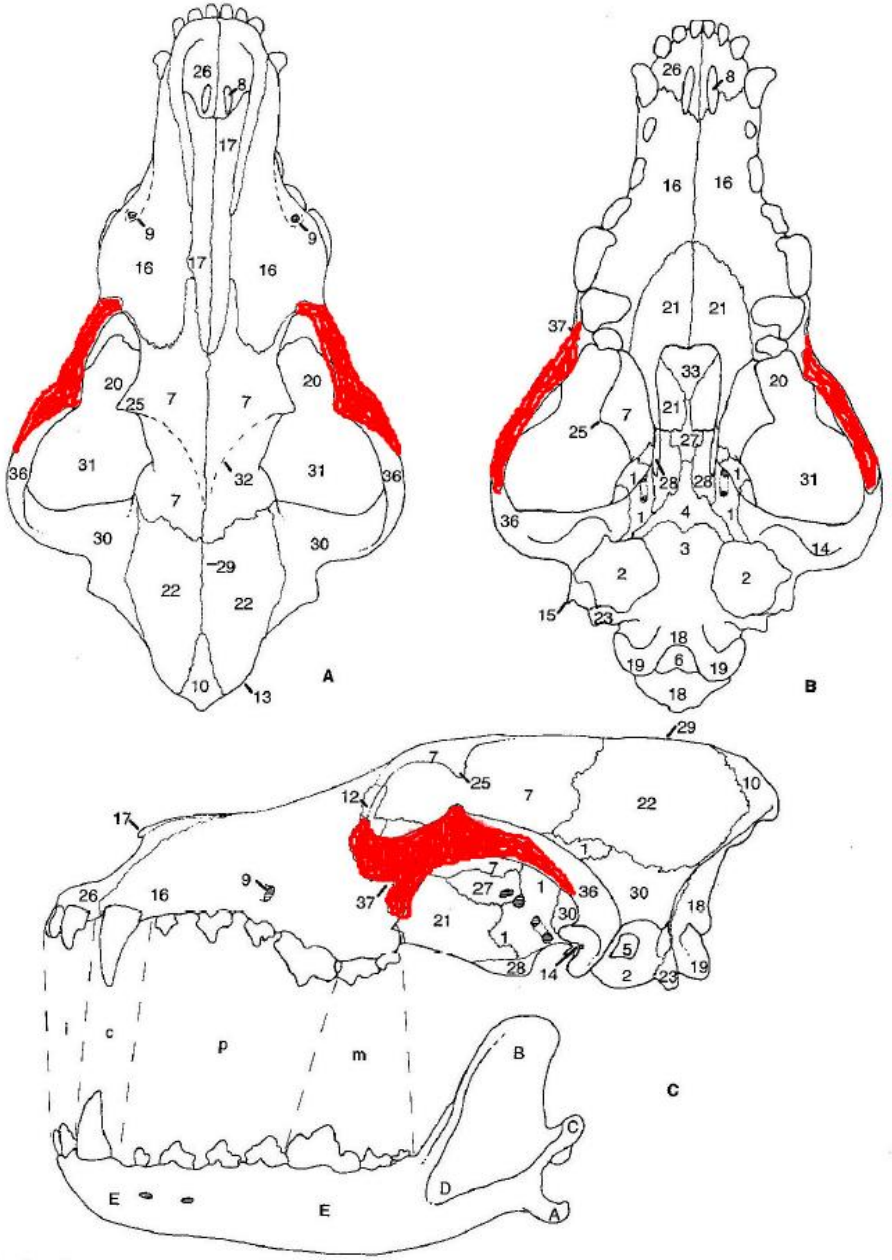
interparietal



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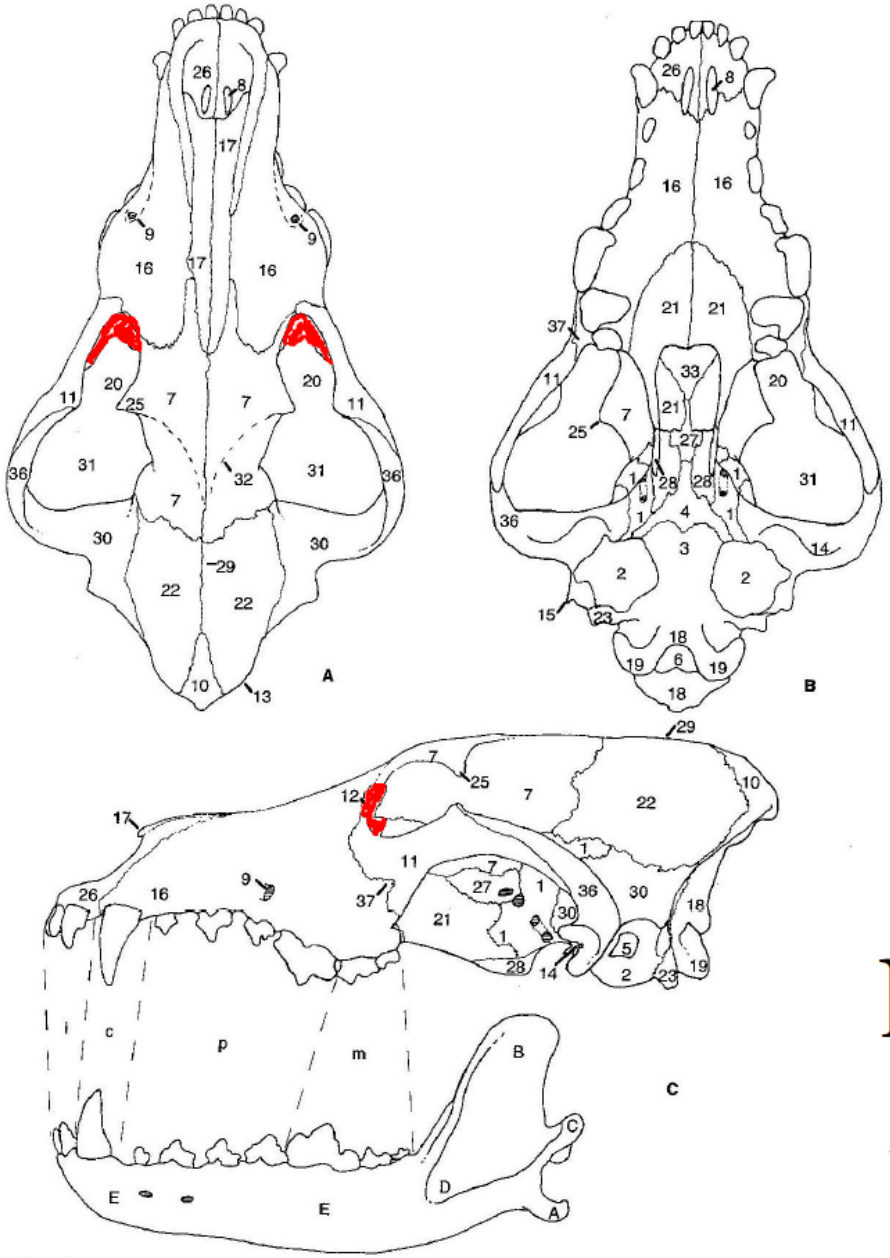
jugal

Parts of the Skull



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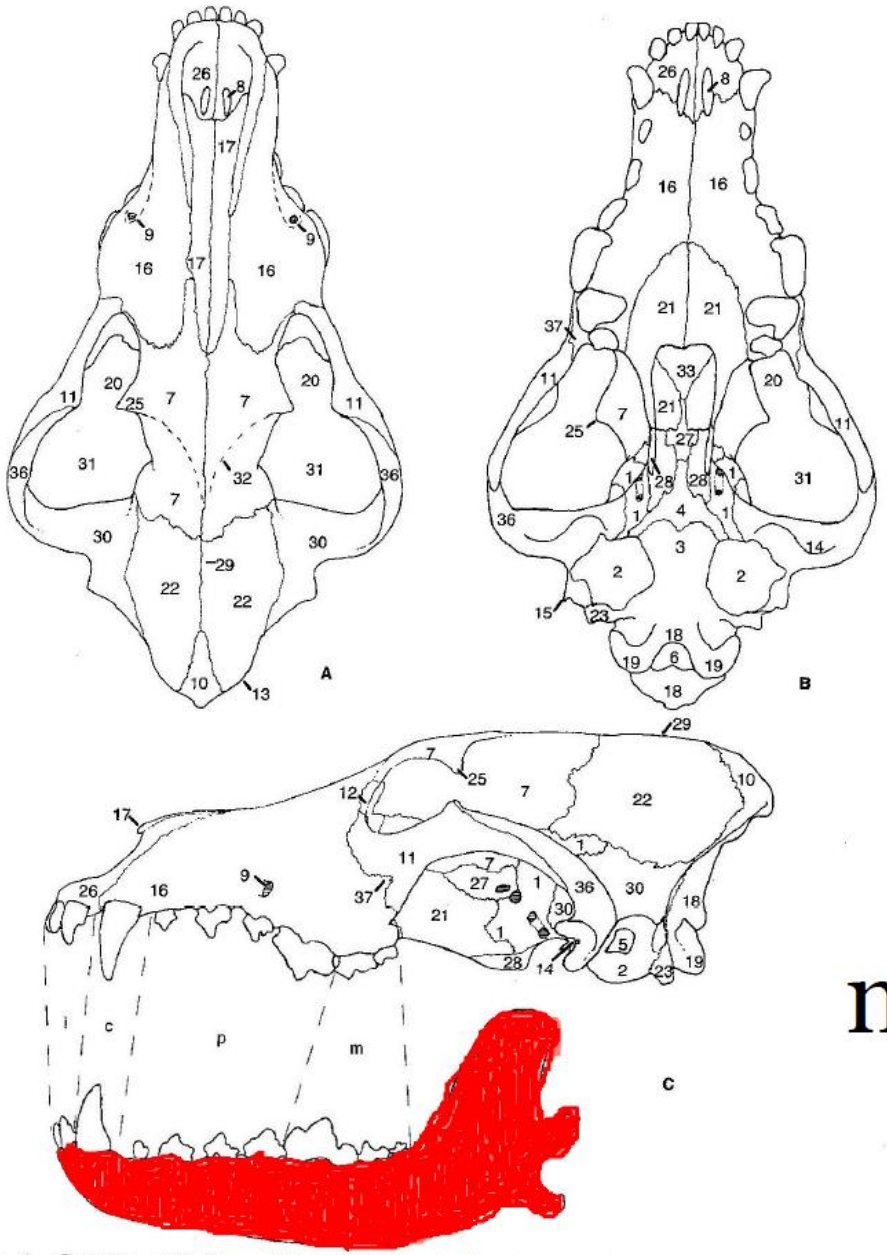
lacrimal



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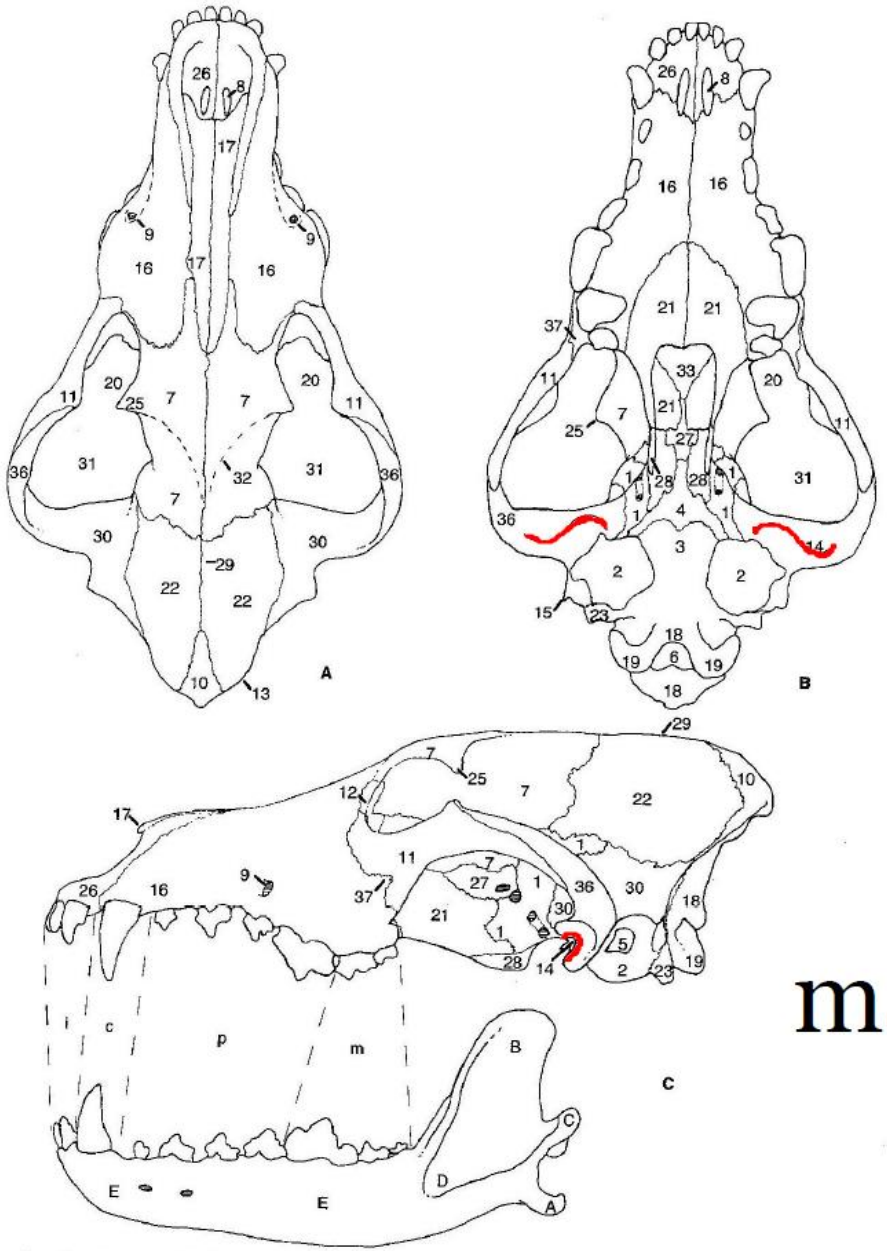
mandible



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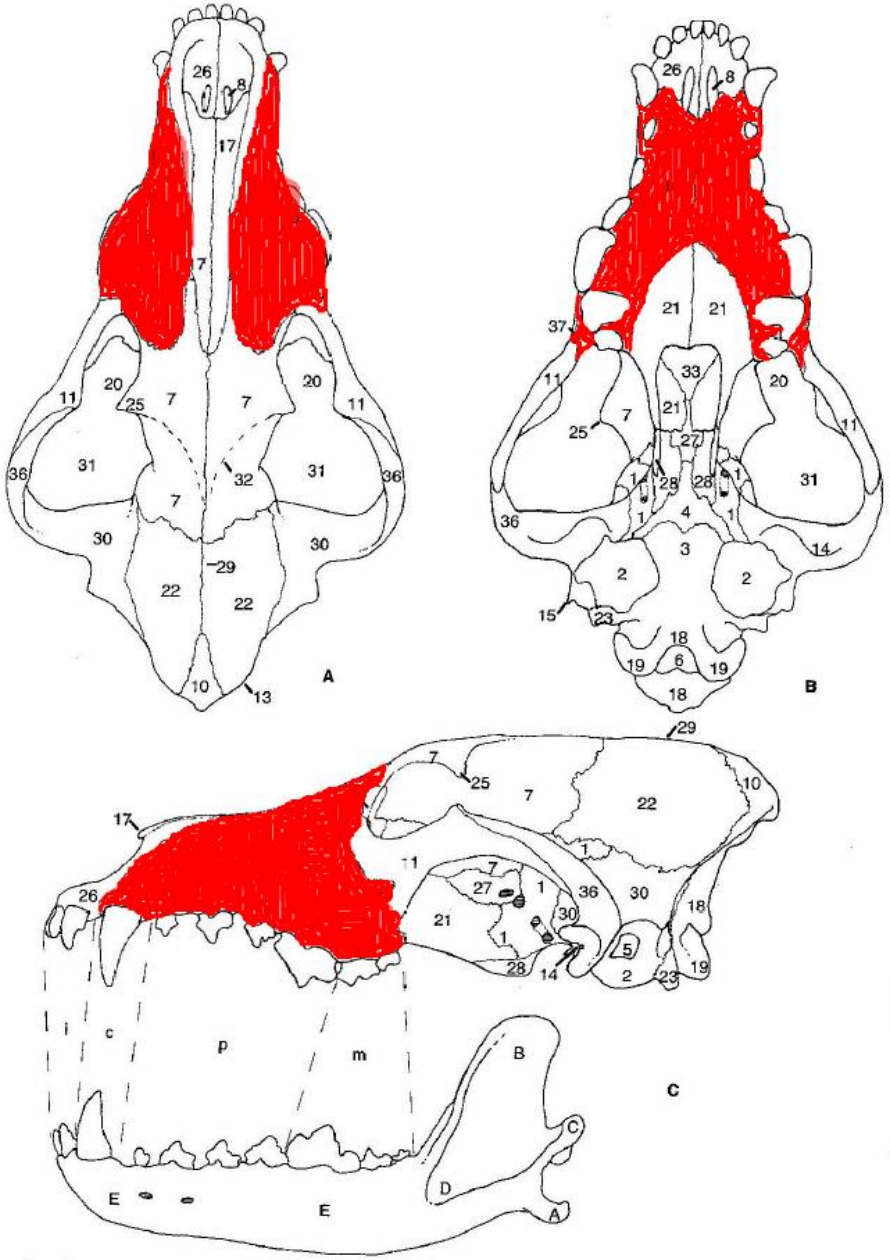
mandibular fossa



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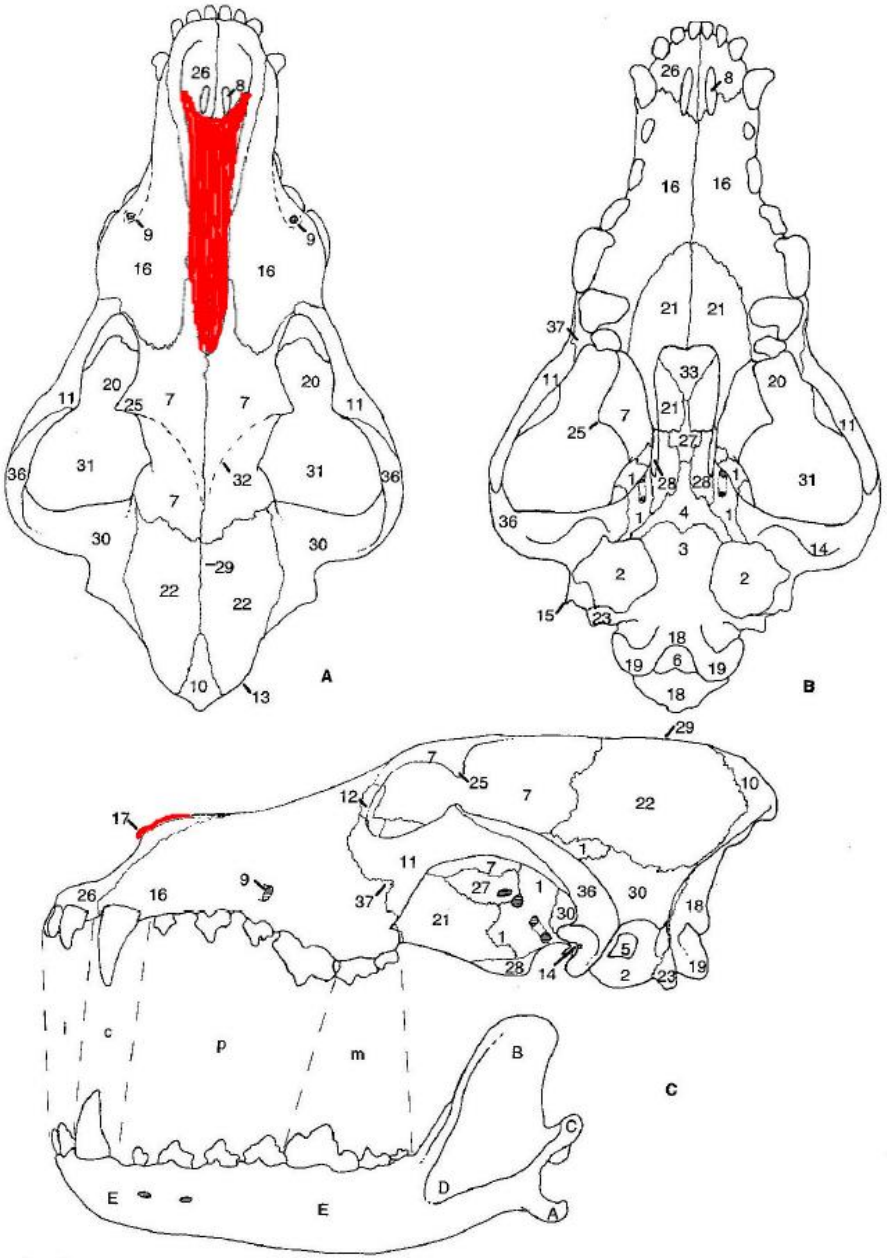
maxilla



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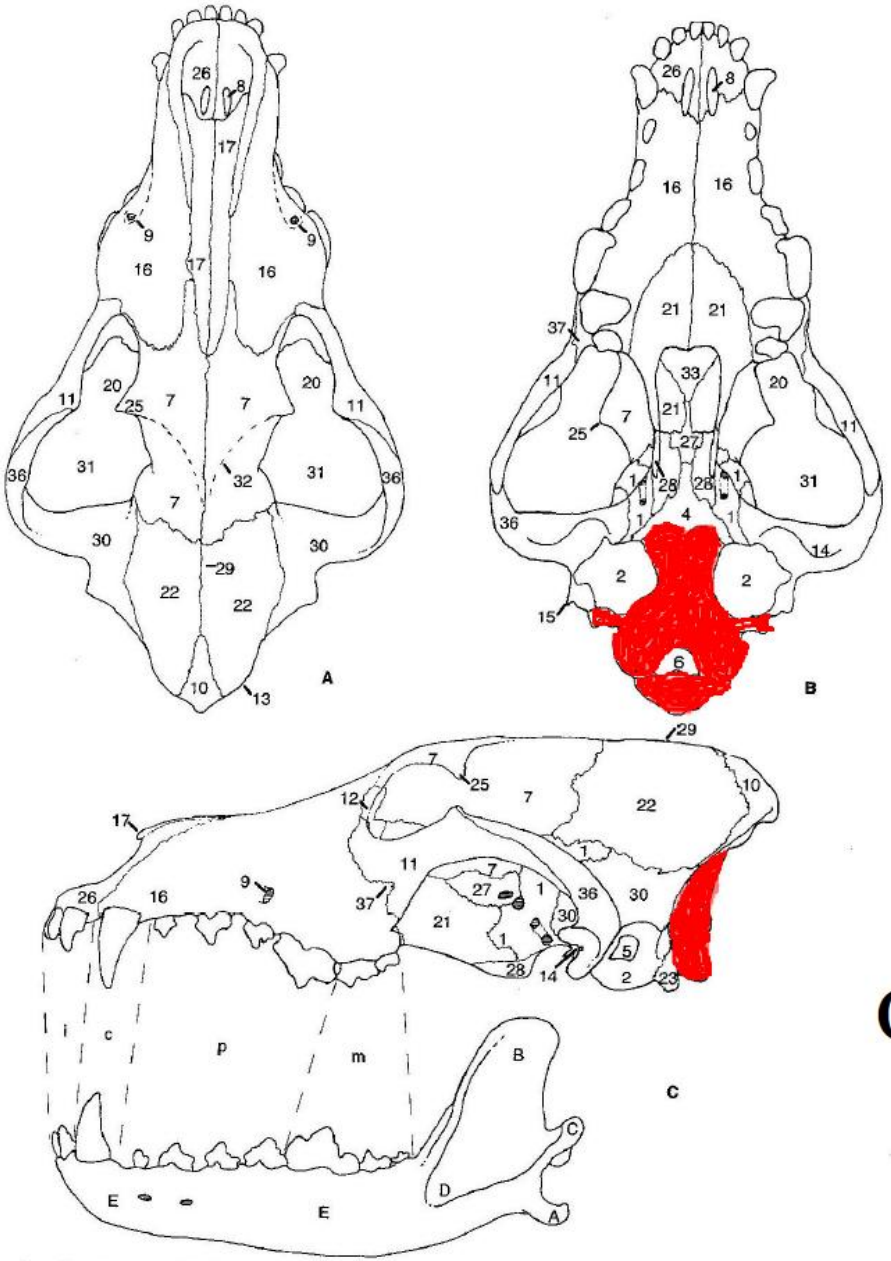
nasal bone



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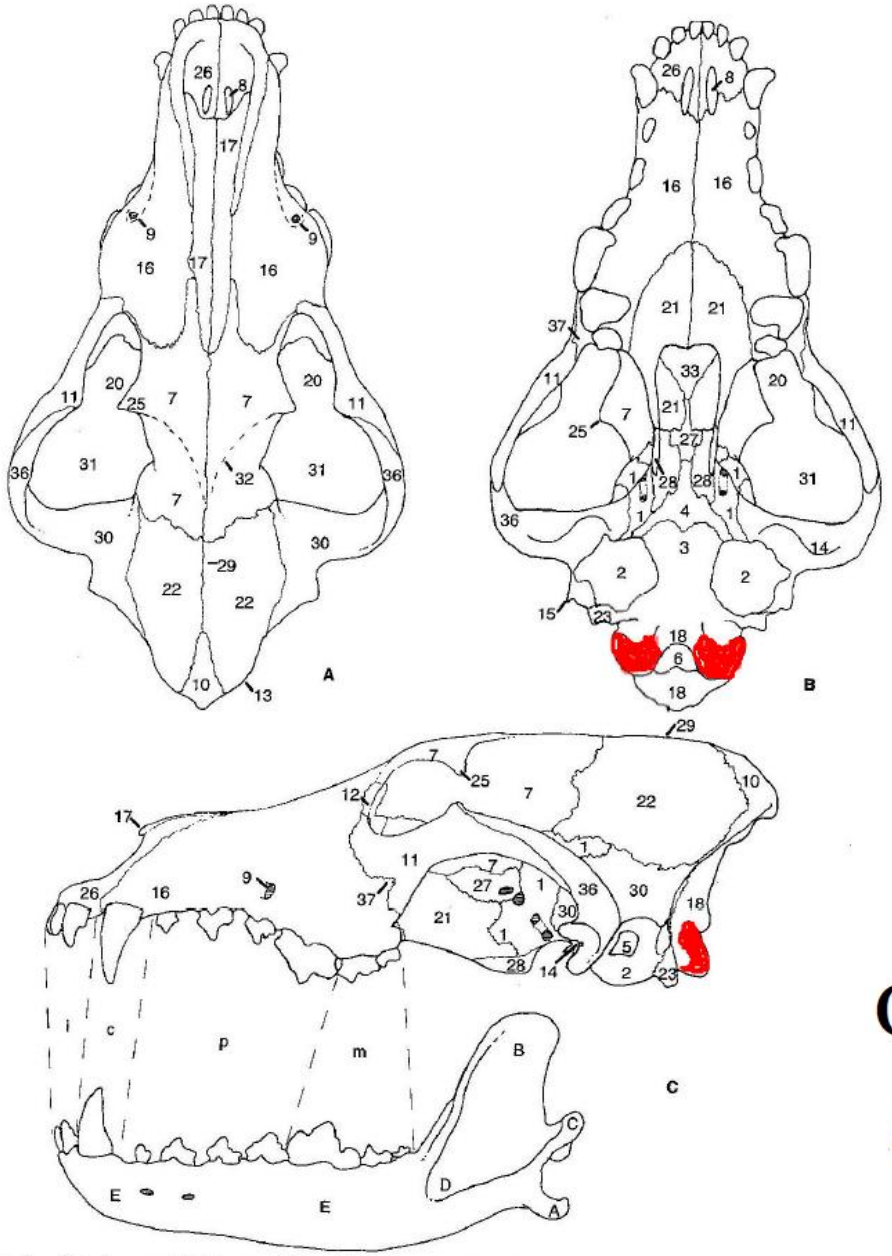
occipital bone



occipital condyle

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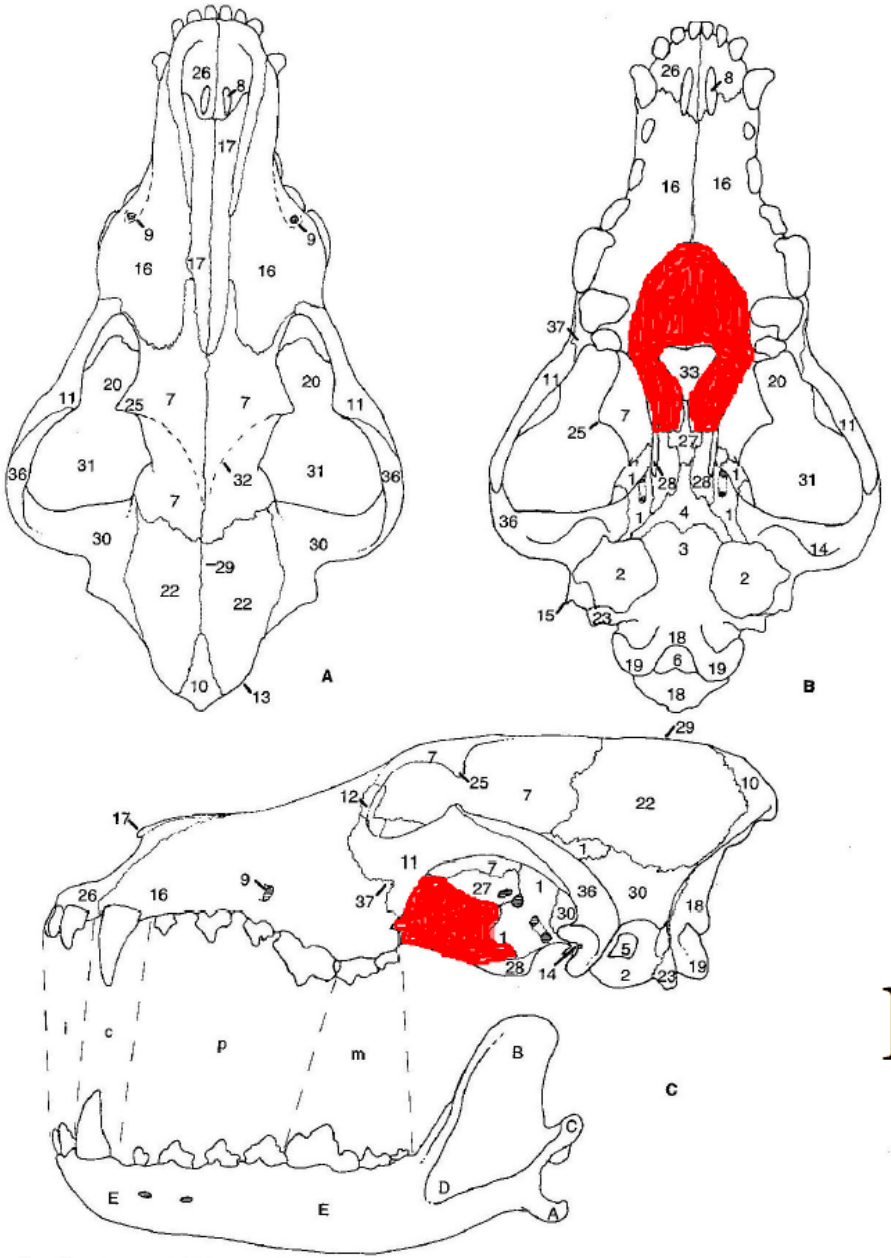

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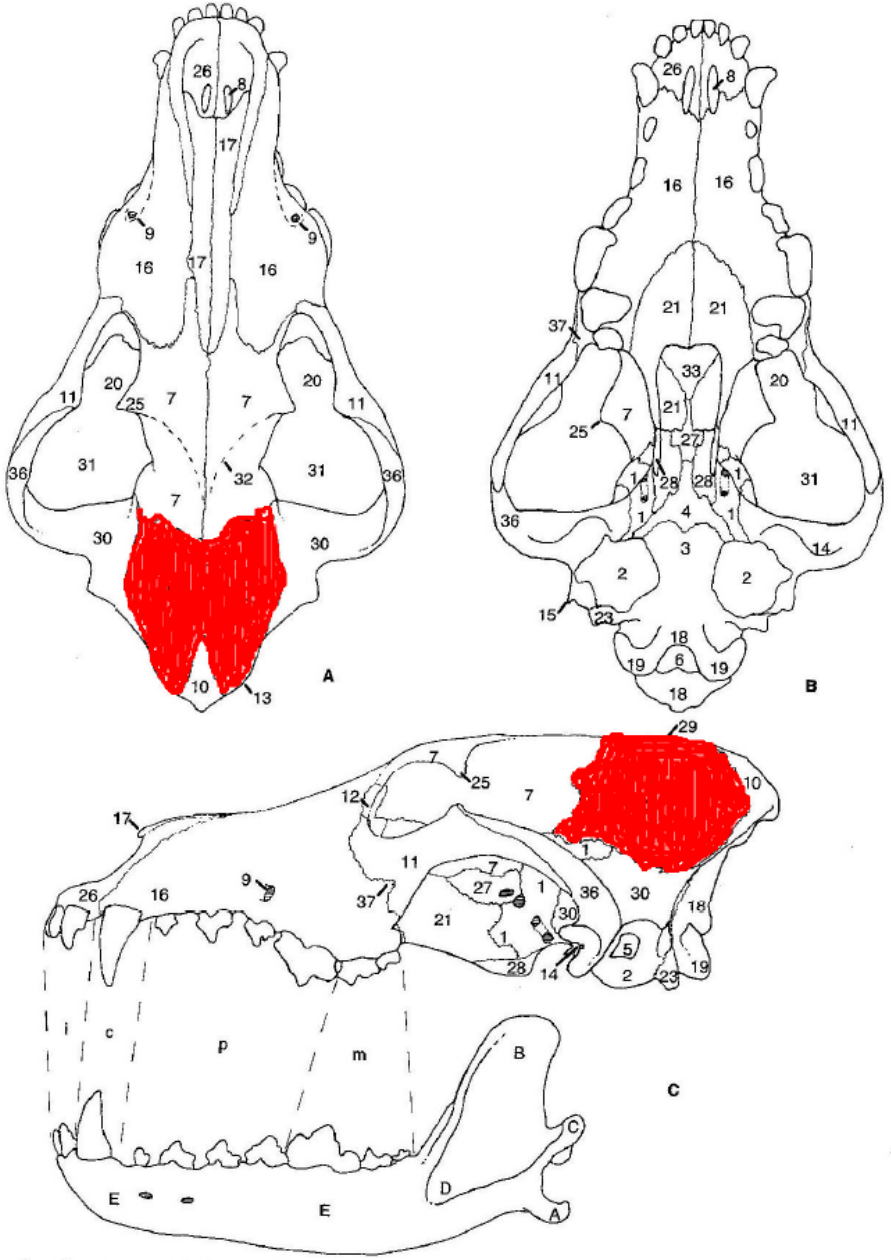
palatine



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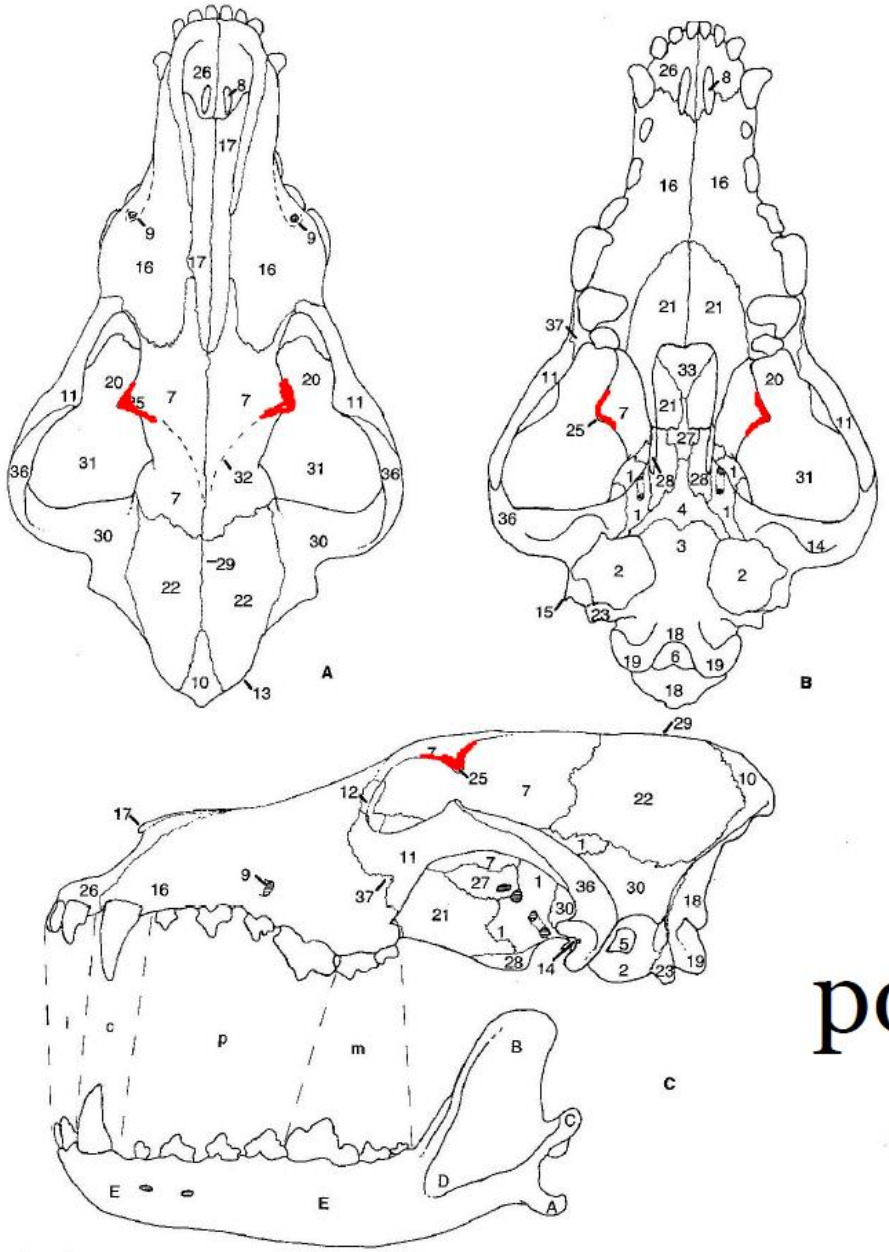
parietal



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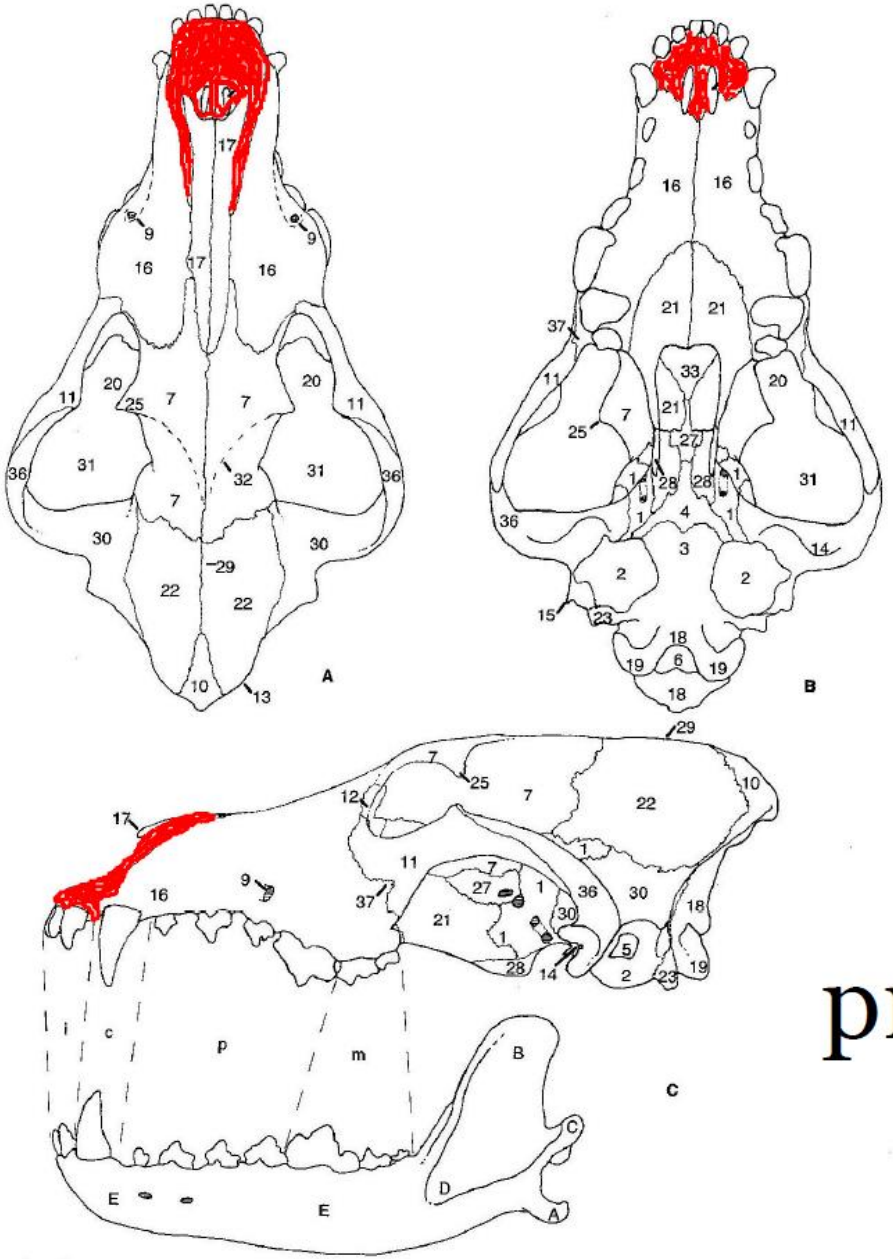
postorbital process



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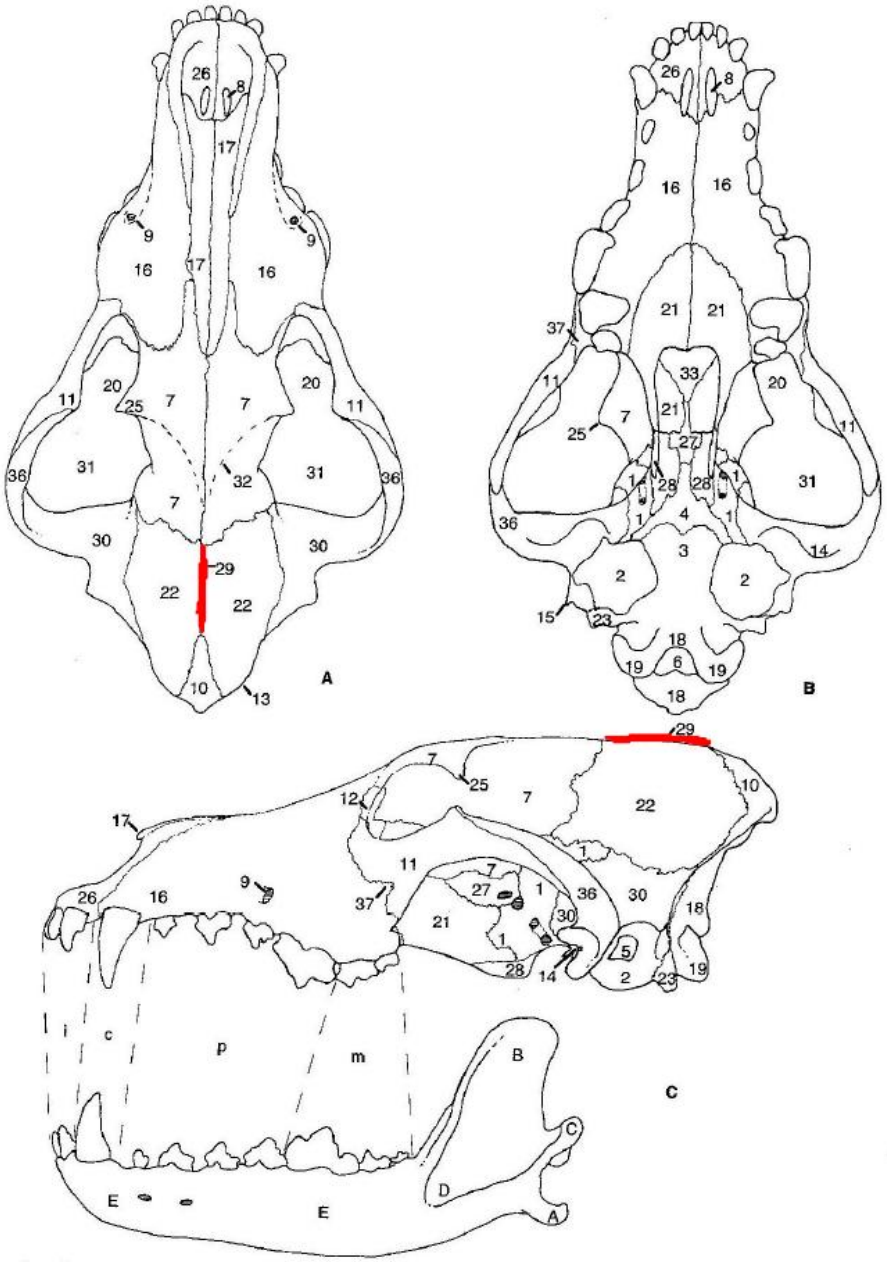

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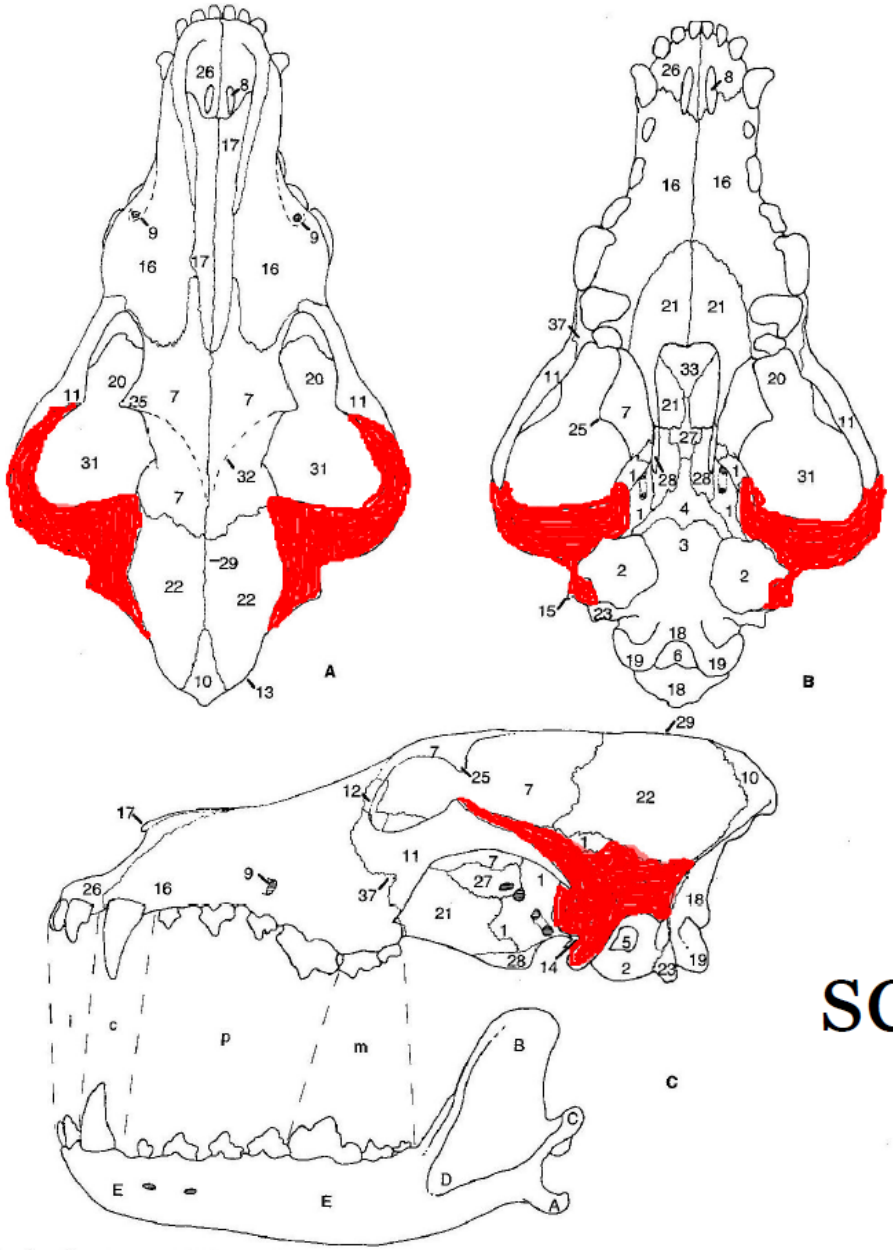
sagittal crest



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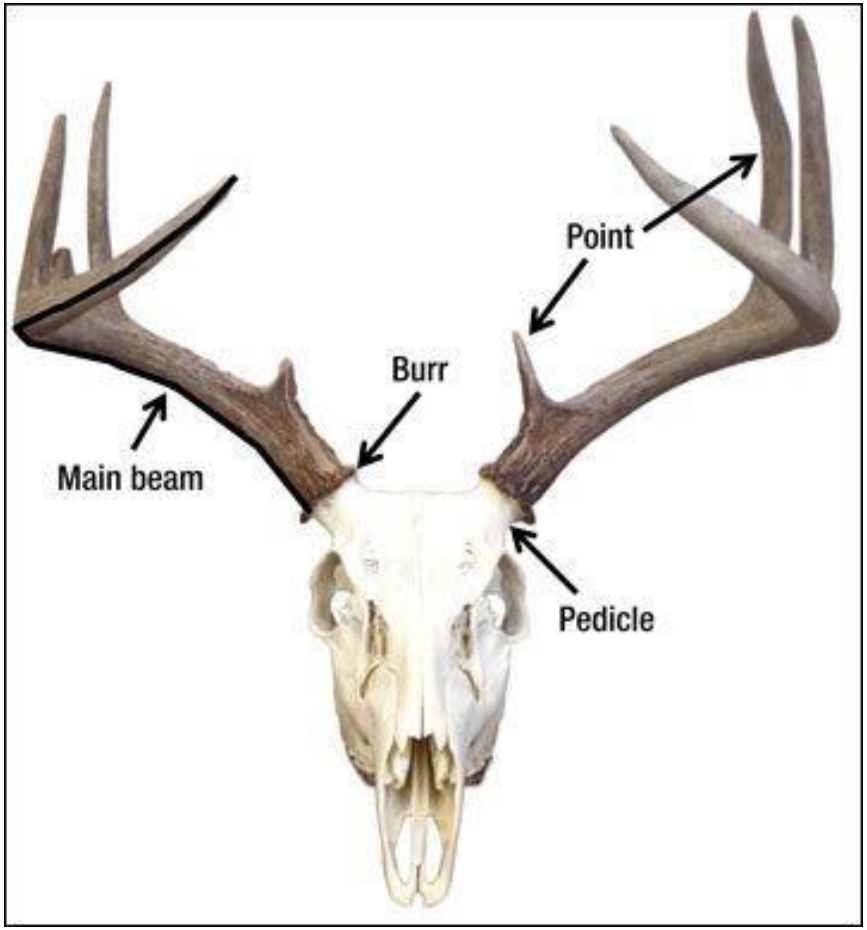
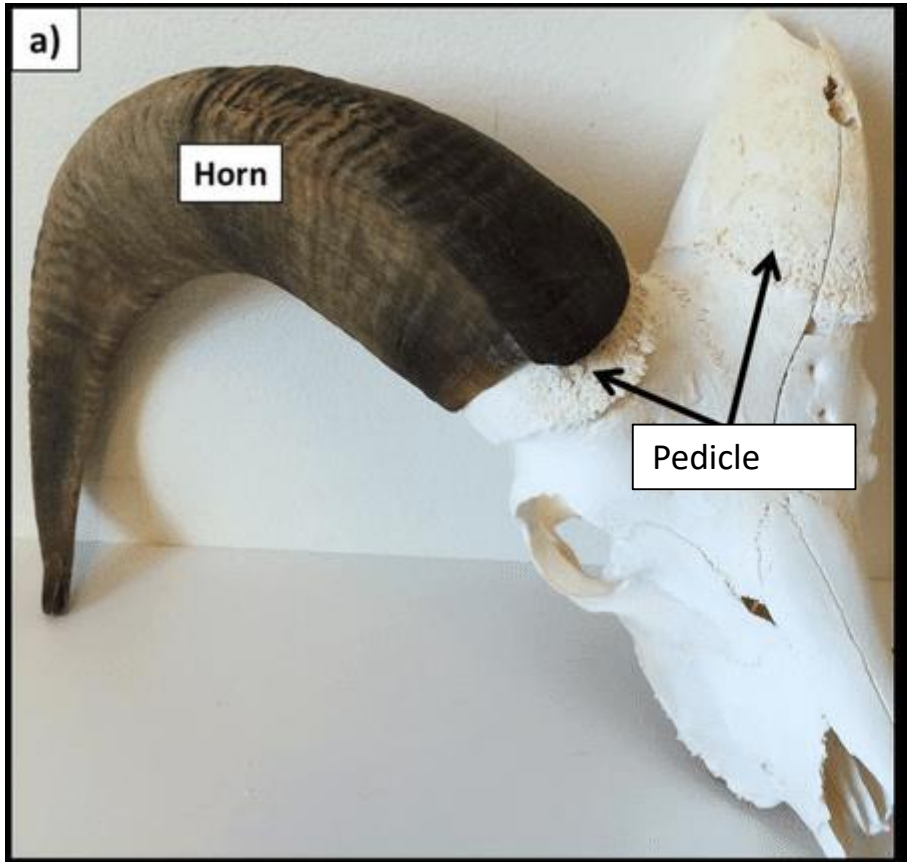
Parts of the Skull

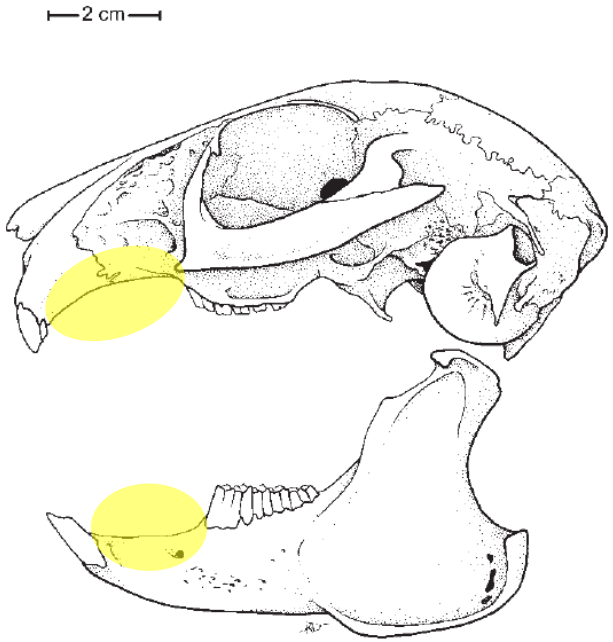




- Pedicle – a protuberance of the frontal bone of the skull found among many ungulates that supports horn or antler growth

Parts of the Skull:

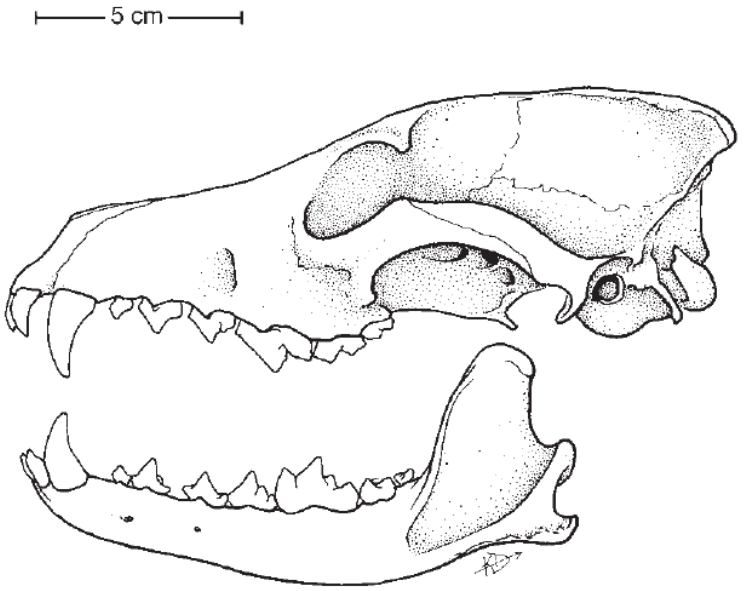
Diastema



Artiodactyla, Perissodactyla, Lagomorpha, Rodentia

VS

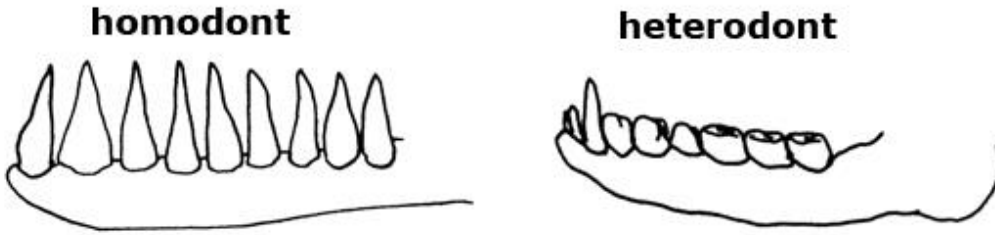
No diastema



Soricomorpha, Didelphimorhpia, Carnivora, Chiroptera

Marsh Rabbit and Coyote

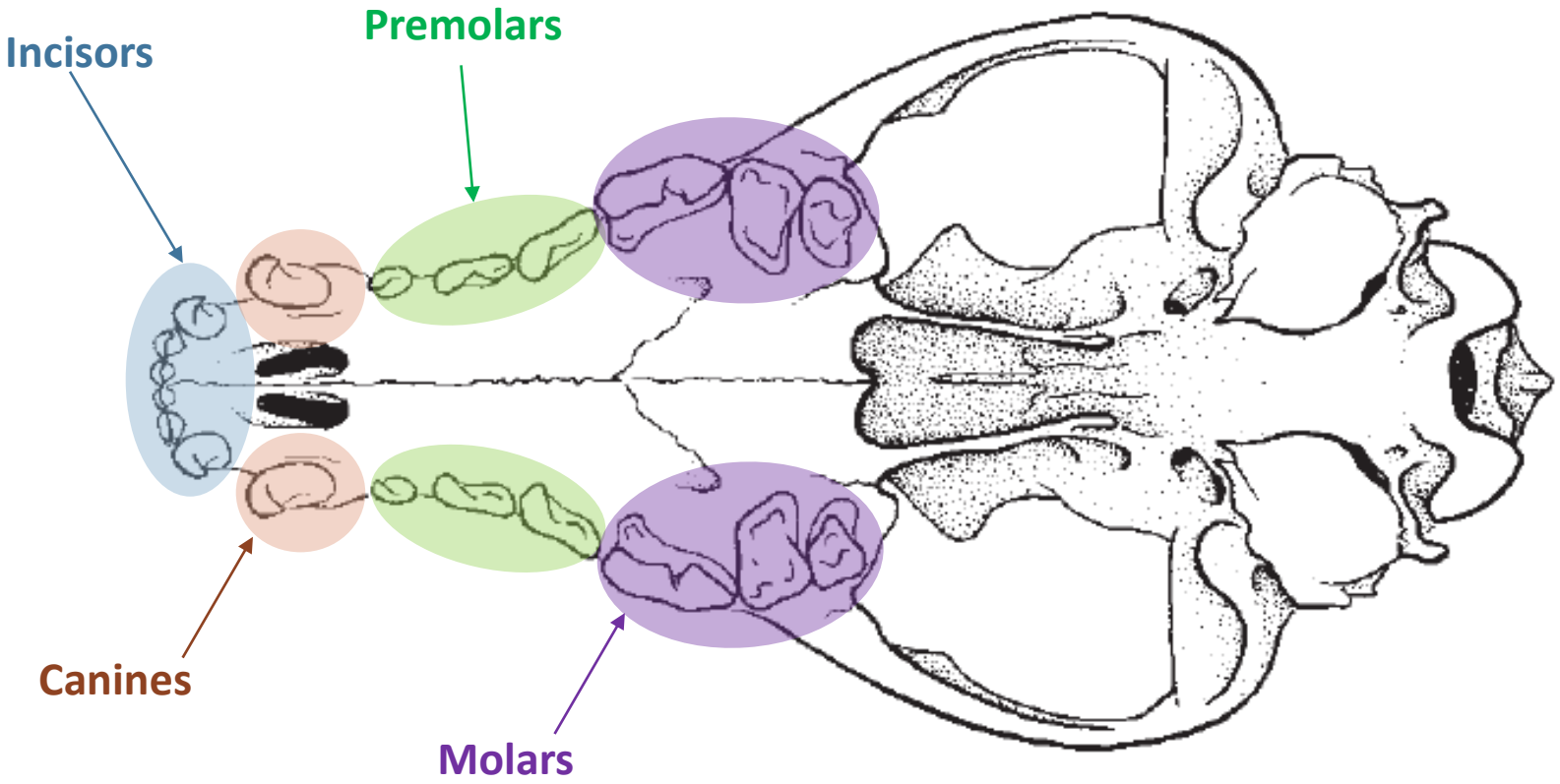
Teeth Patterns



- Homodont
  - All teeth are the same
  - Armadillo (main one in this lab)

- Heterodont
  - All teeth are different
  - Incisors, Canines, Premolars, Molars
  - All other species (most terrestrial mammals)

Heterodont



Ventral view of red wolf skull from Trani et al. 2007. Land Manager's Guide to Mammals of the South. Pp. 441

Incisors

- Usually unicuspid
- Used for grasping or cutting
- Restricted to premaxilla

Canines

- Unicuspid and single-rooted
- Used for stabbing or holding
- Never more than 4 total canines, two on each side, one on top, and one on bottom
- First tooth located in the maxilla

Premolars

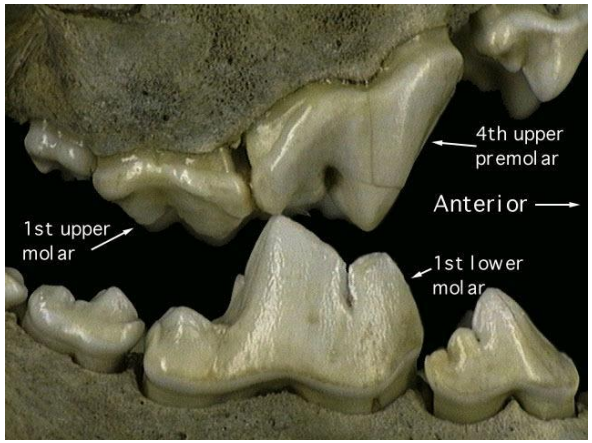
- Can be unicuspid, bicuspid, tricuspid, multicuspid
- They vary in function and size
- Usually two roots

Molars

- Bicuspid, tricuspid, or multicuspid,
- Vary in function and size
- Fully erupted in adults only
- Usually 3 roots

Carnassials

- Commonly called the carnassial pair
- Self-sharpening combination of a premolar and molar tooth typically found only in the order Carnivora
- Important for slicing and cutting



What about elephant tusks?

Incisors!

Occlusal Patterns

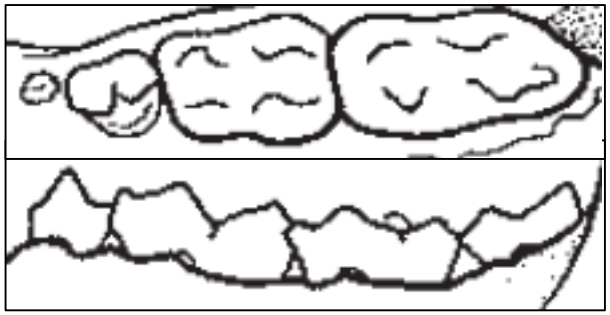
- Occlusal Patterns – the forms of the outside of the teeth

- In particular, these occlusal patterns or forms describe the shape of the cuspids on the premolars and molars
- These shapes determine how food is masticated

Occlusal Patterns

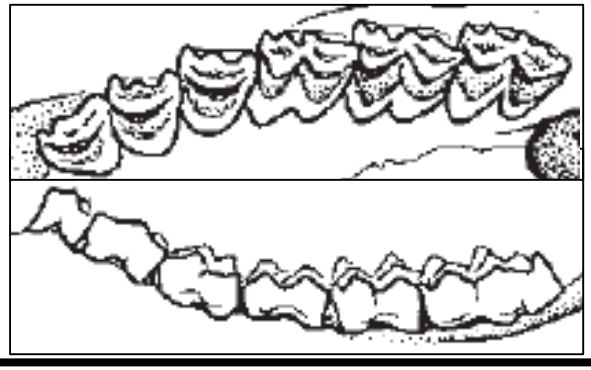
- Bunodont
  - Cusps of teeth with rounded or low conical shapes
  - Omnivores (e.g. Humans, Suidae)
- Selenodont
  - Cusps of teeth with cresents in griding surface (i.e., “moon tooth”)
  - Ruminants (e.g. Cervidae, Bovidae)
- Lophodont
  - Cusps of teeth formed in transverse or longitudinal crests or ridges
  - Hind gut fermenters (e.g. Rodentia, Lagpmorpha, Equidae)
- Dilambdodont
  - Pre-molars/molars have cutting edges in shape of “W”
  - Insectivores (e.g. Soricomorpha)
- Tribosphenic
  - Premolars/molars have 3 cusps
  - (e.g. Opossums)
- Secodont
  - Pre-molars/molars have cutting edges on cusps (i.e., carnassial shears)
  - Carnivores (e.g. Carnivora)

Bunodont – Black bear

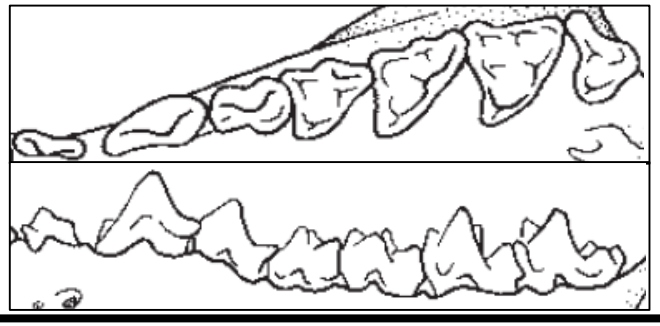


Dilambdodont – Smoky Shrew

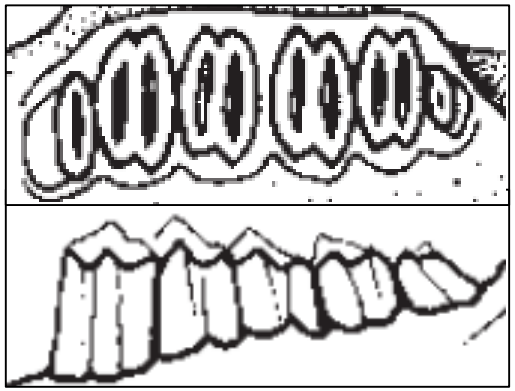
Selenodont – White-tailed Deer



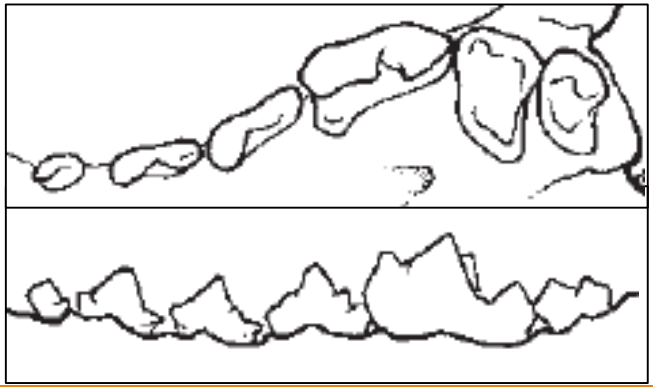
Tribosphenic – Virginia Opossum



Lophodont – Eastern Cottontail



Secodont – Red Wolf



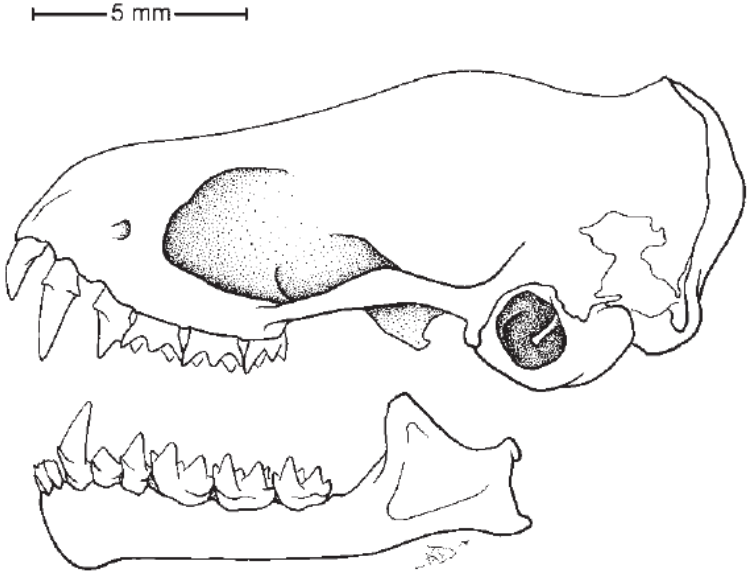
Top picture = Left dorsal view of cranium; Bottom picture = Lateral view of left mandible

Images from species accounts in Trani et al. 2007. Land Manager's Guide to Mammals of the South

Dental Formulae

- Way of designating the number and arrangement of teeth
- I = Incisors
- C = Canines
- P = Premolars
- M = Molars
- Upper mandible/lower mandible
- Dental Formula :

  I 1/2, C 1/1, P 1/2, M 3/3 = 14 x 2 = **28**



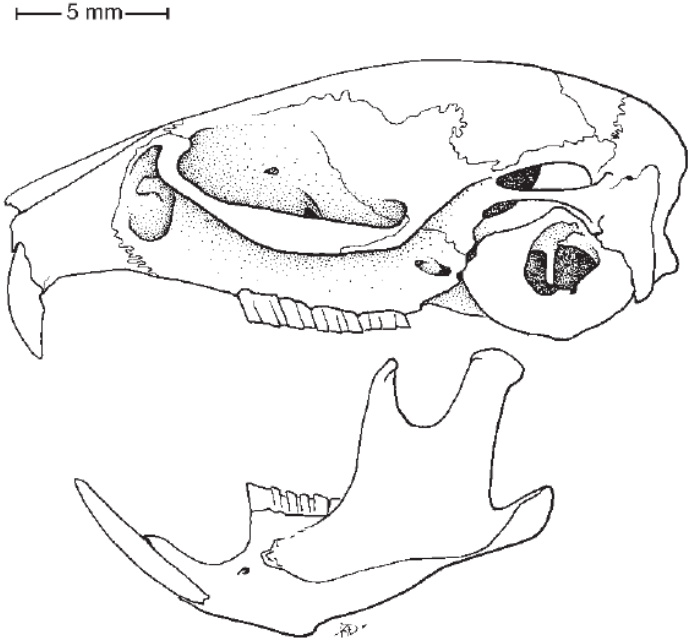
For one side of skull, so need to multiple by 2!!

Tadarida brasiliensis (Mexican free-tailed bat) skull

Dental Formulae

- Way of designating the number and arrangement of teeth
- I = Incisors
- C = Canines
- P = Premolars
- M = Molars
- Upper mandible/lower mandible
- Dental Formula :

  I 1/1, C 0/0, P 0/0, M 3/3 = 8 x 2 = **16**

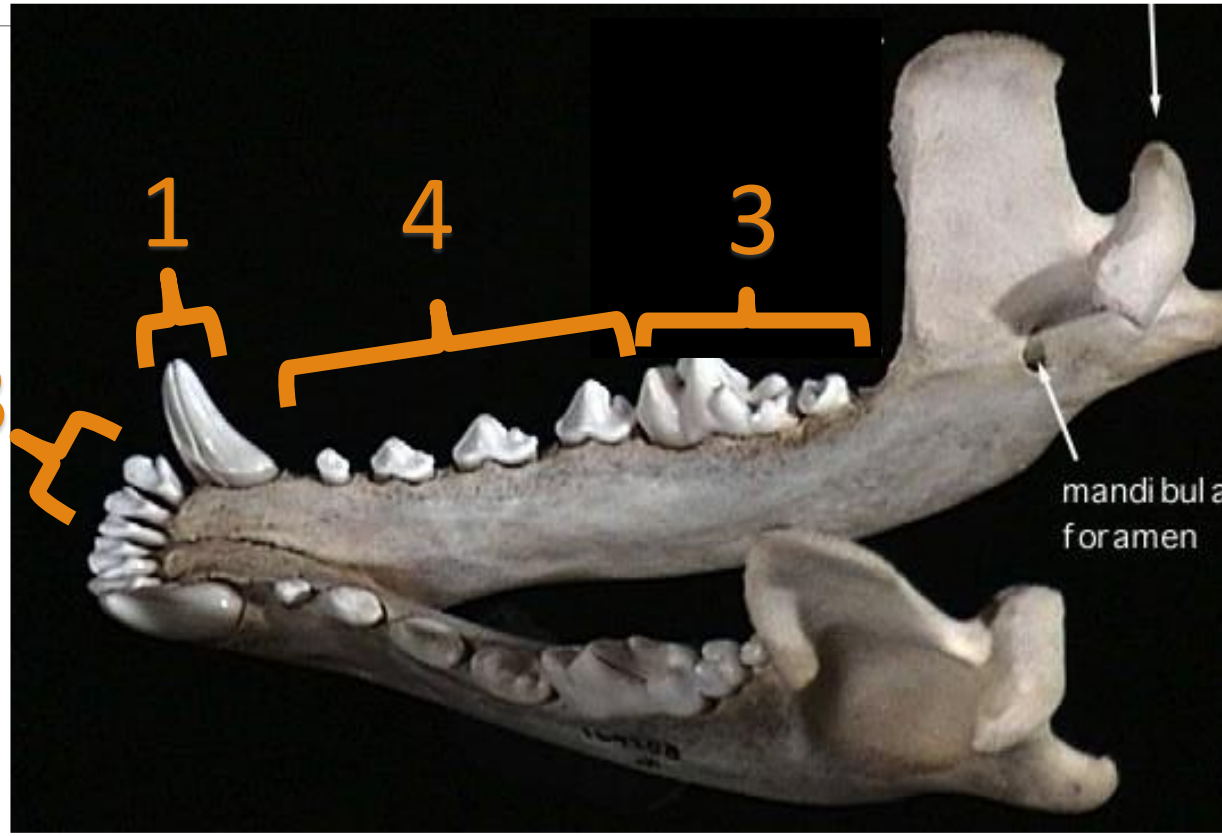


Microtus pennsylvanicus (meadow vole) skull

Dental Formulae

- On bottom:

- Incisors = 3
- Canines = 1
- Premolars = 4
- Molars = 3



Canis lupus (gray wolf) jawbone

Dental Formulae

- On top:

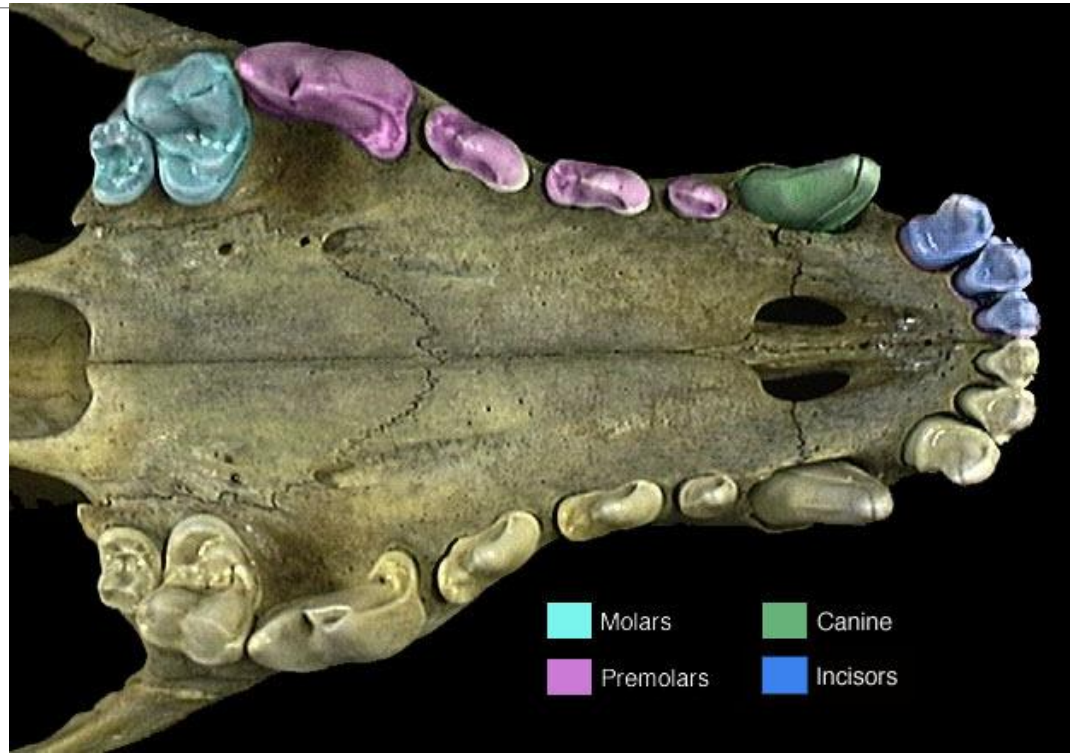
- Incisors = ?
- Canines = ?
- Premolars = ?
- Molars = ?

Canis lupus (gray wolf) skull

Dental Formulae

- On top:

- Incisors = 3
- Canines = 1
- Premolars = 4
- Molars = 2



Canis lupus (gray wolf) skull

Dental Formulae

- On top:
  - Incisors = 3
  - Canines = 1
  - Premolars = 4
  - Molars = 2
- I3 C1 P4 M2

- On bottom:
  - Incisors = 3
  - Canines = 1
  - Premolars = 4
  - Molars = 3
- I3 C1 P4 M3

- **(3/3 + 1/1 + 4/4 + 2/3) x 2 = 42**

Canis lupus (gray wolf) skull

Today's Lab

- Full Cat Skeletons
- Full Bat Skeleton
- Full Primate Skeleton
- Ungulate, Carnivore, and Rodent Skulls
- Ungulate Legs

Canis lupus (gray wolf) skull

Bones to Know:

Carpals

Clavicle

Femur

Fibula

Humerus

Ilium

Ischium

Metacarpals

Metatarsals

Patella

Phalanges

Pubis

Radius

Ribs

Sacrum

Scapula

Sternum

Tarsals

Tibia

Ulna

Cervical vertebrae

Thoracic vertebrae

Lumbar vertebrae

Caudal vertebrae

Auditory bulla

Basioccipital

External auditory meatus

Foramen magnum

Frontal

Infraorbital foramen

Interparietal

Jugal

Lacrimal

Mandible

Mandibular fossa

Maxilla

Nasal bone

Occipital Bone

Occipital condyle

Palatine

Parietal

Postorbital process

Premaxilla

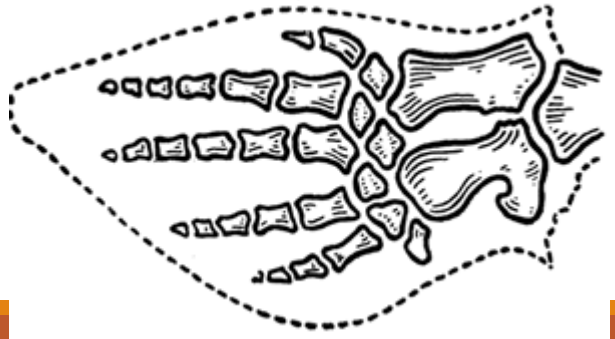
Sagittal crest

Squamosal bone

Canis lupus (gray wolf) skull

Phalange Formulae

- Start with first digit on the side of the radius for forelimbs and the side with the tibia for hindlimbs
- Count the number of phalanges associated with each digit and place a dash between each one
- This can be useful in delinieating between species (e.g. cats are 4-4-4-3 while dogs are 4-4-4-4)
- Whale fin = (1-5-5-5-3)



Phalange Formulae