

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*





Domain
Eukarya

Kingdom
Animalia

Phylum
Chordata

Class
Mammalia

Order
Carnivora

Family
Canidae

Genus
Vulpes

Species
vulpes

Scientific Nomenclature

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

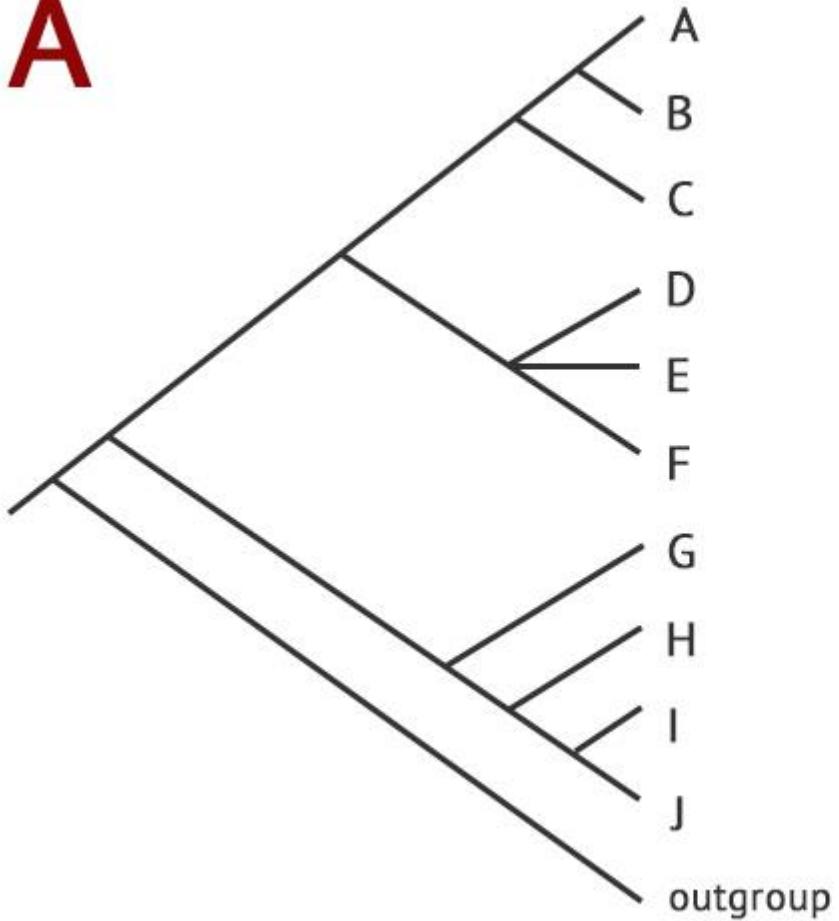
- Genus and Species
 - Genus is capitalized
 - species is not capitalized
 - Genus and species need to be written in *italics* or underlined
 - When only keyed to genus, followed by “spp.”

Scientific Nomenclature

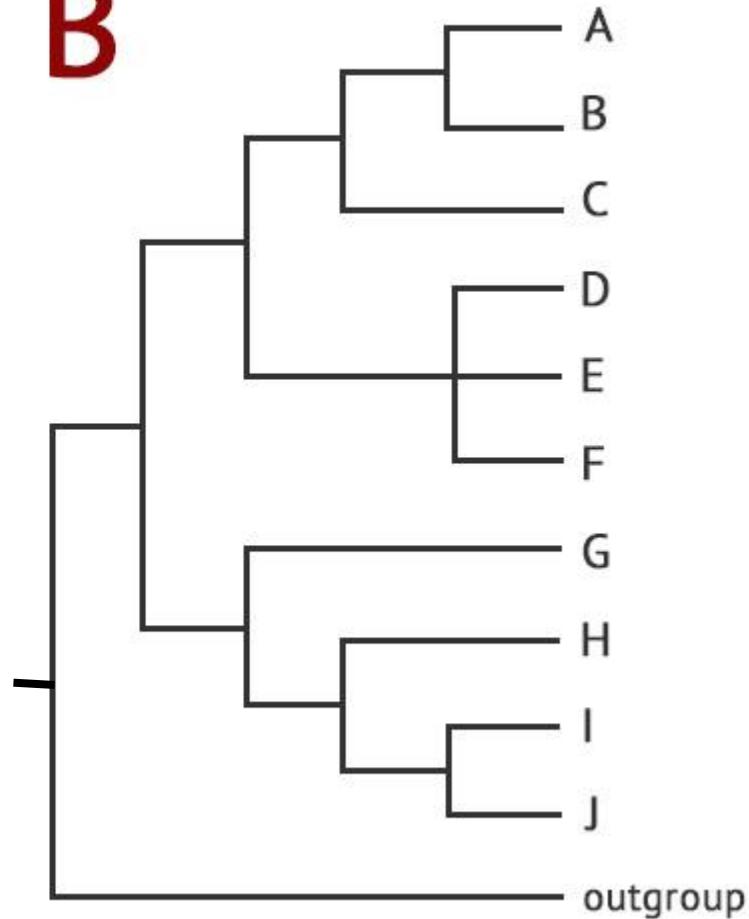
- A. *Homo sapiens*
- B. *Homo* *sapiens*
- C. *Homo Sapiens*
- D. *homo sapiens*
- E. *homo sapiens*
- F. *Homo Sapiens*
- G. *Homo sapiens*
- H. *Homo sapiens*
- I. *homo sapiens*
- J. *Homo sapiens*
- K. *Homo Sapiens*
- L. *Homo spp.*

Cladograms

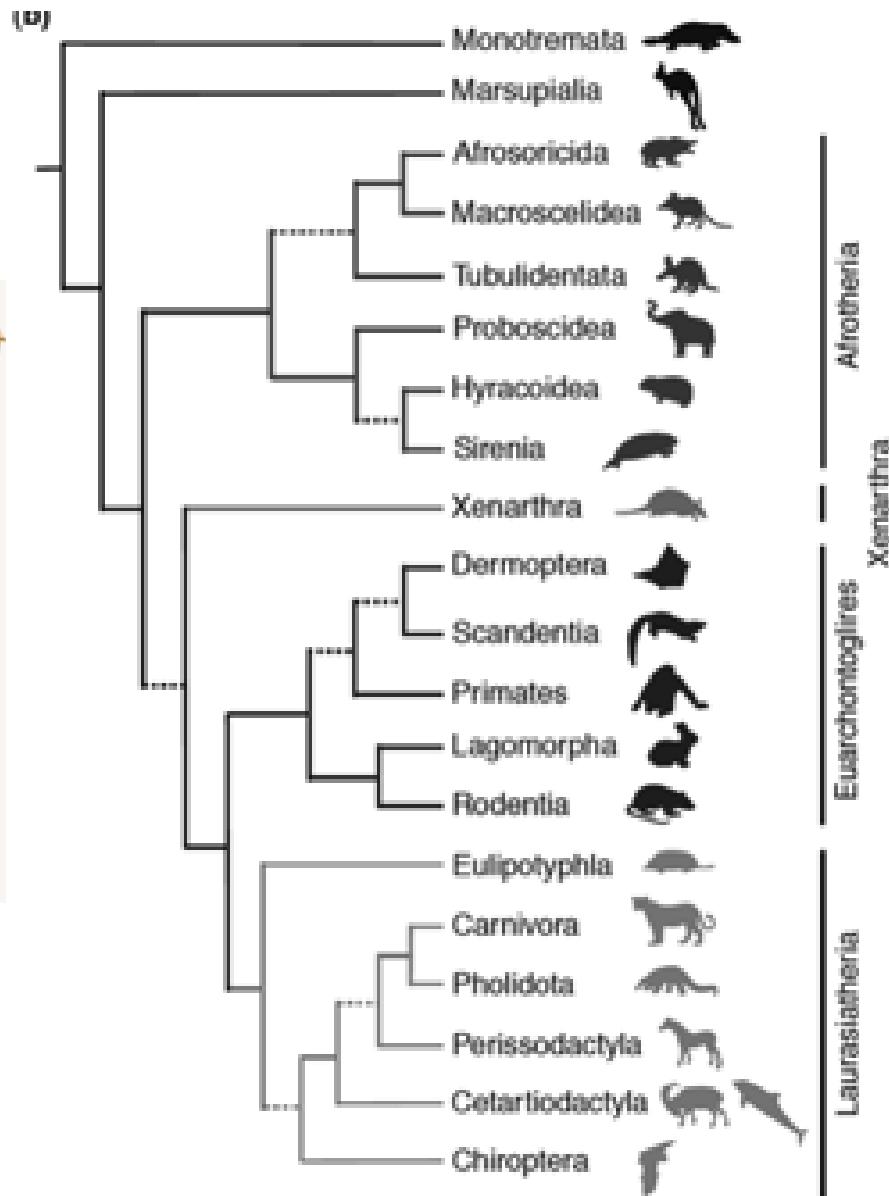
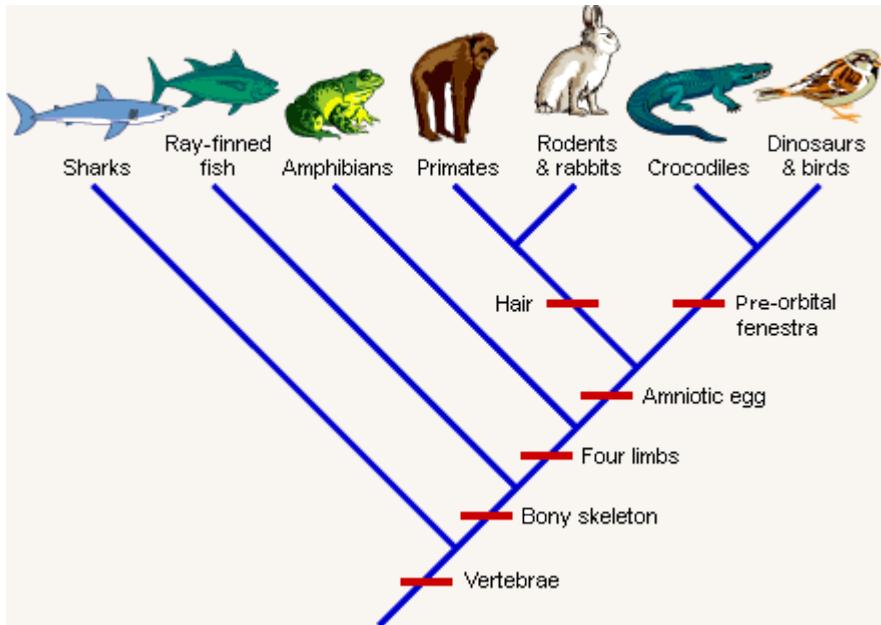
A



B



Cladograms



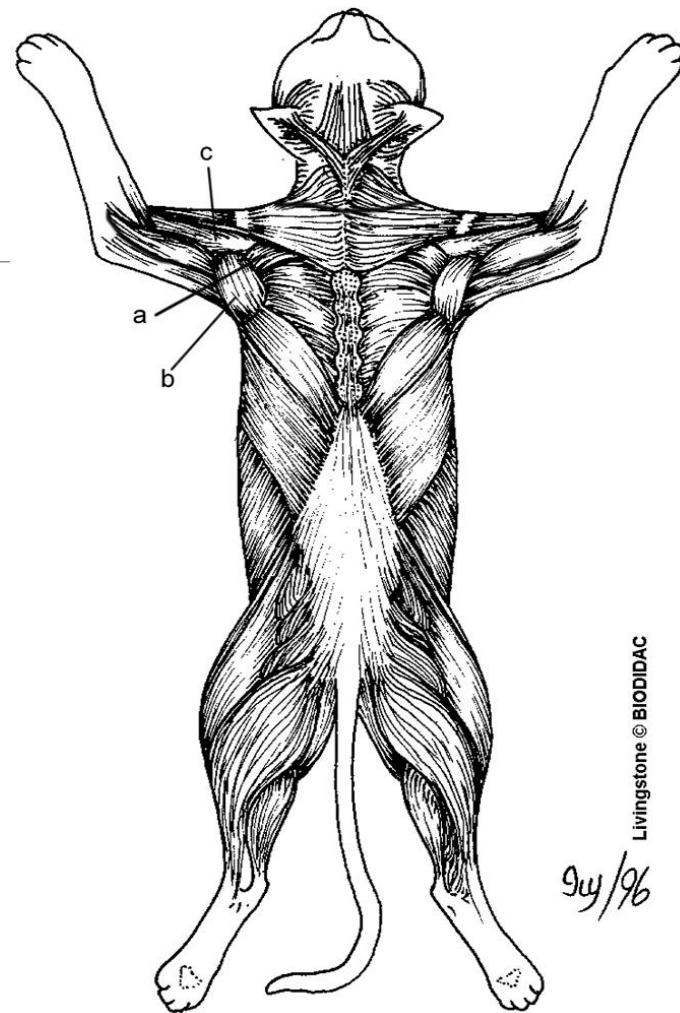
Behavioral Key Terms

- 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

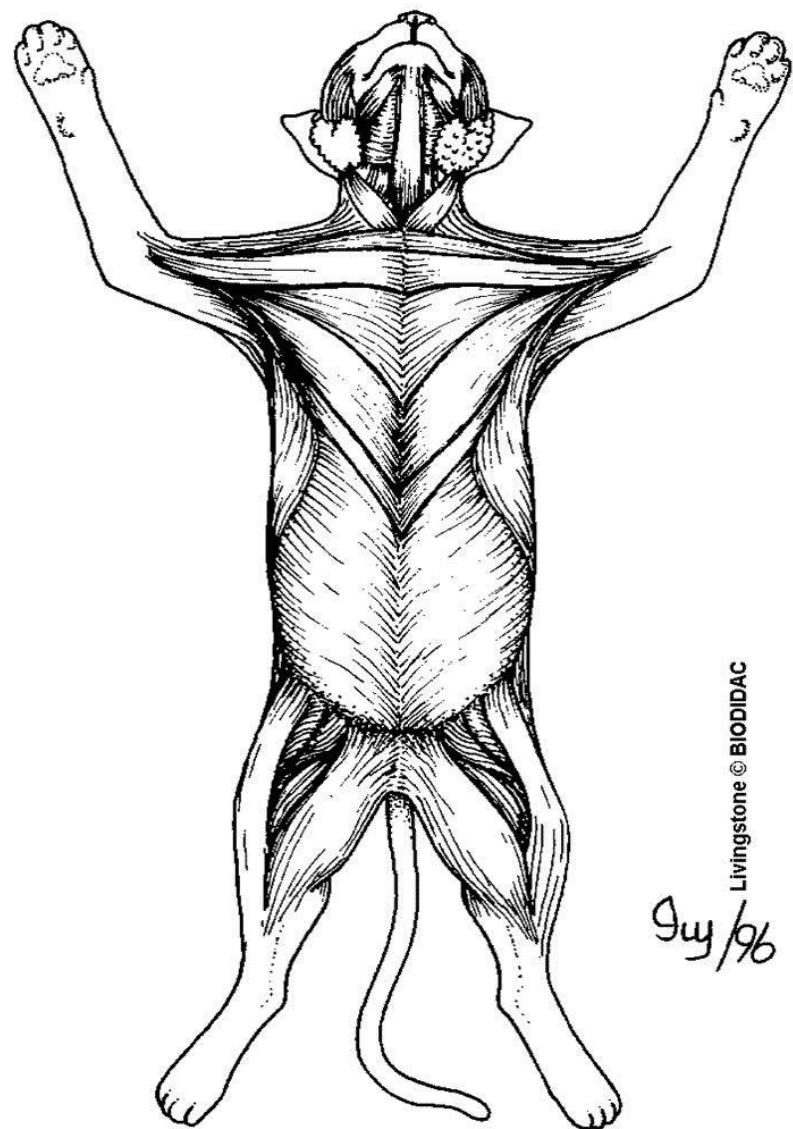
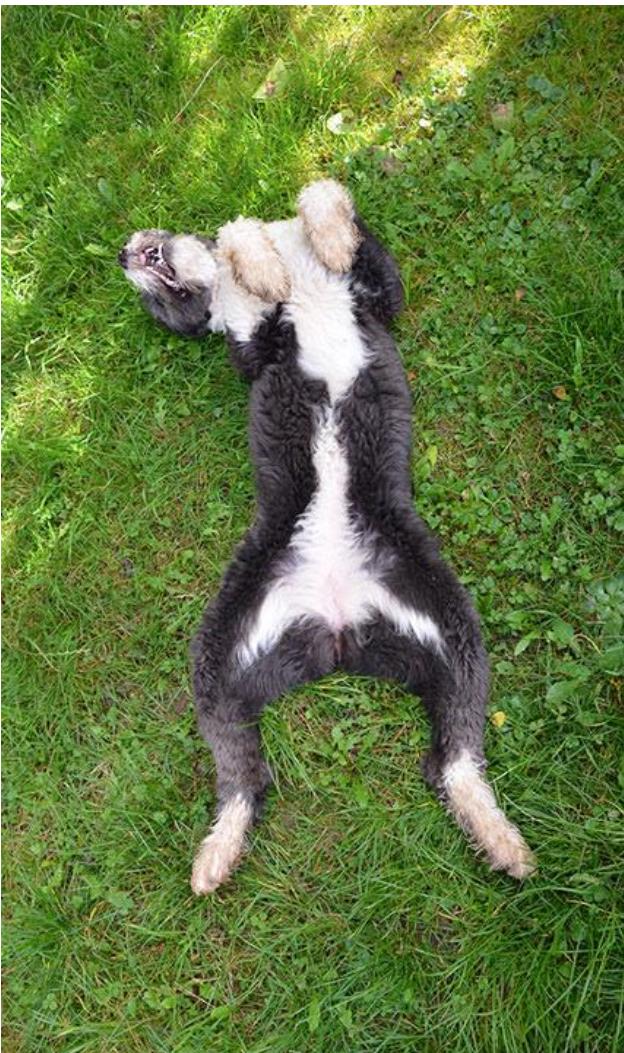
Anatomical Directions

- 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

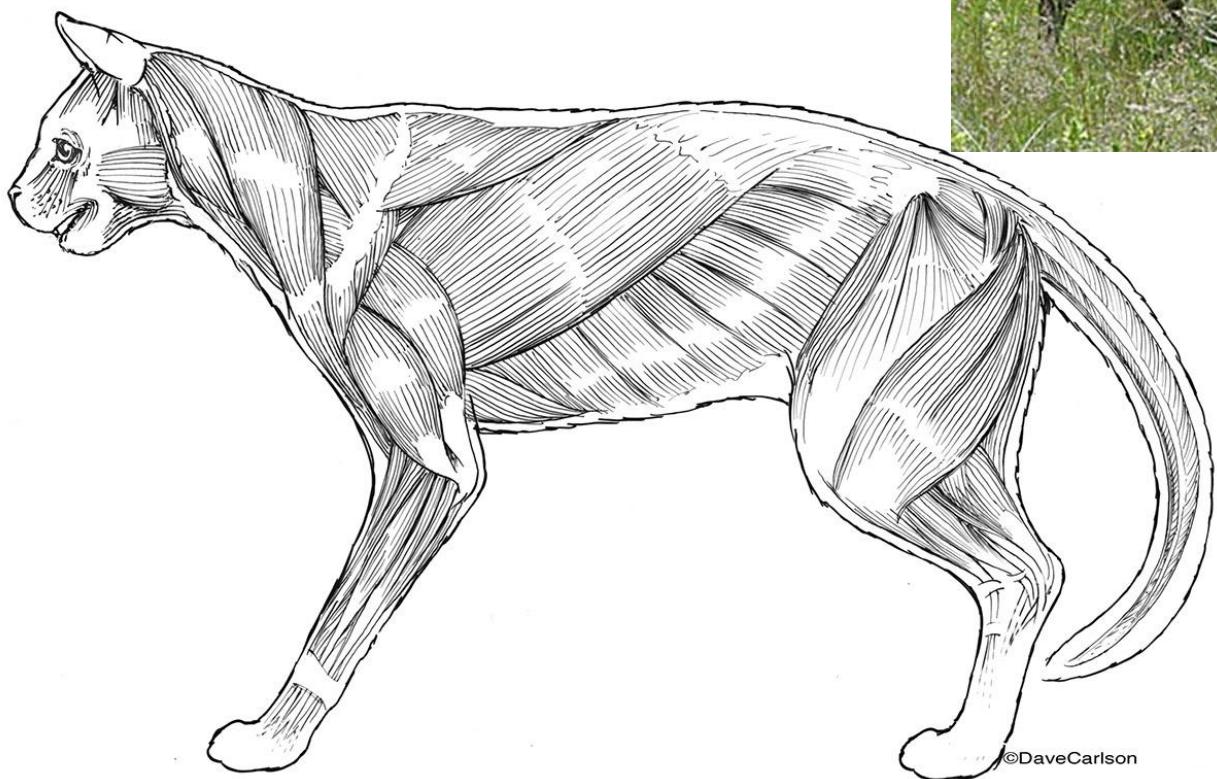
Dorsal View



Ventral View



Lateral View



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Skeletons

MAMMALOGY 2019

The Skeleton

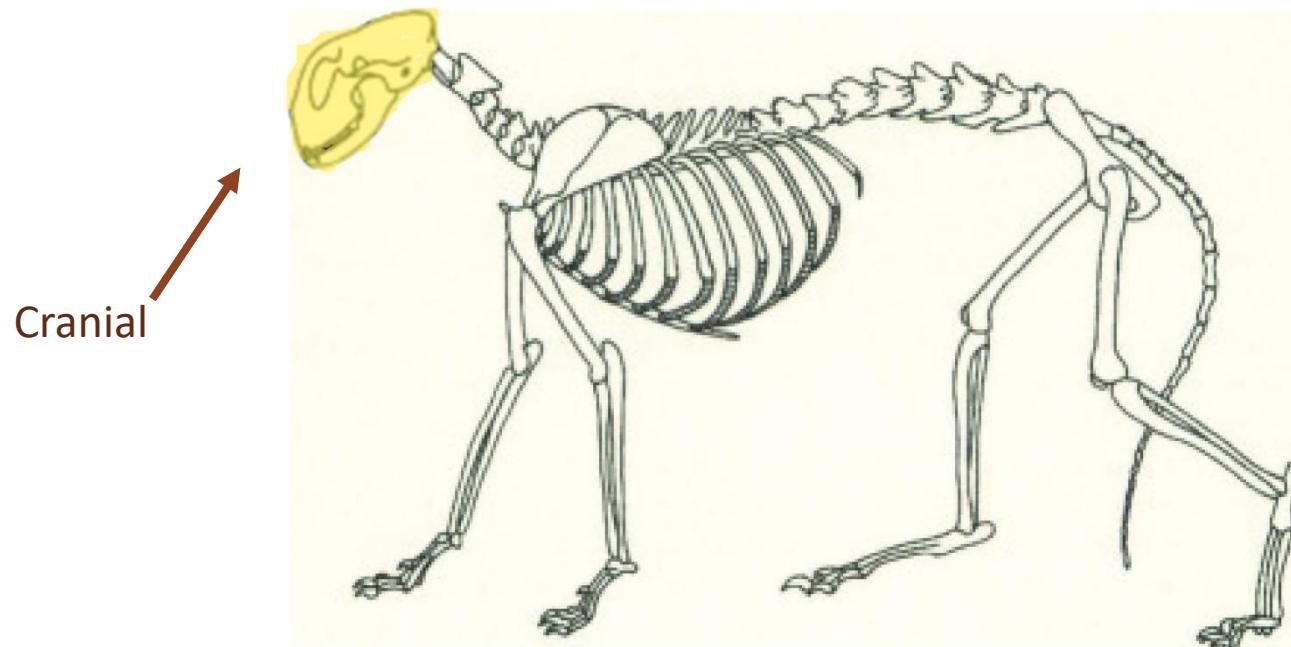


Figure 6.1.
A cat skeleton.

The Skeleton

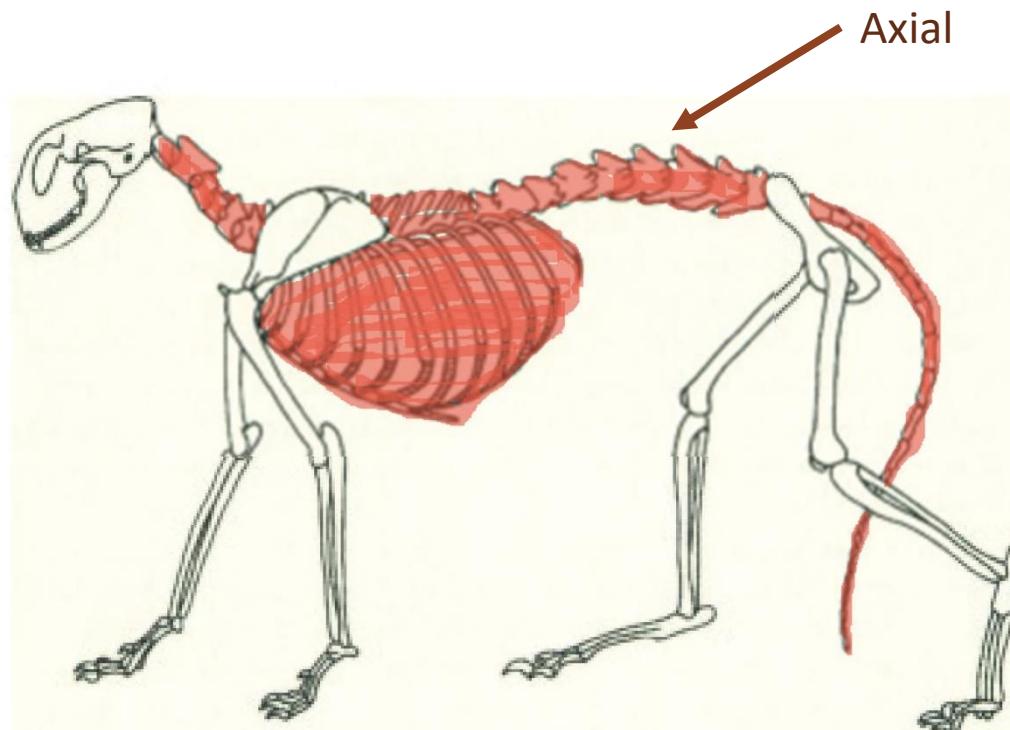


Figure 6.1.
A cat skeleton.

The Skeleton

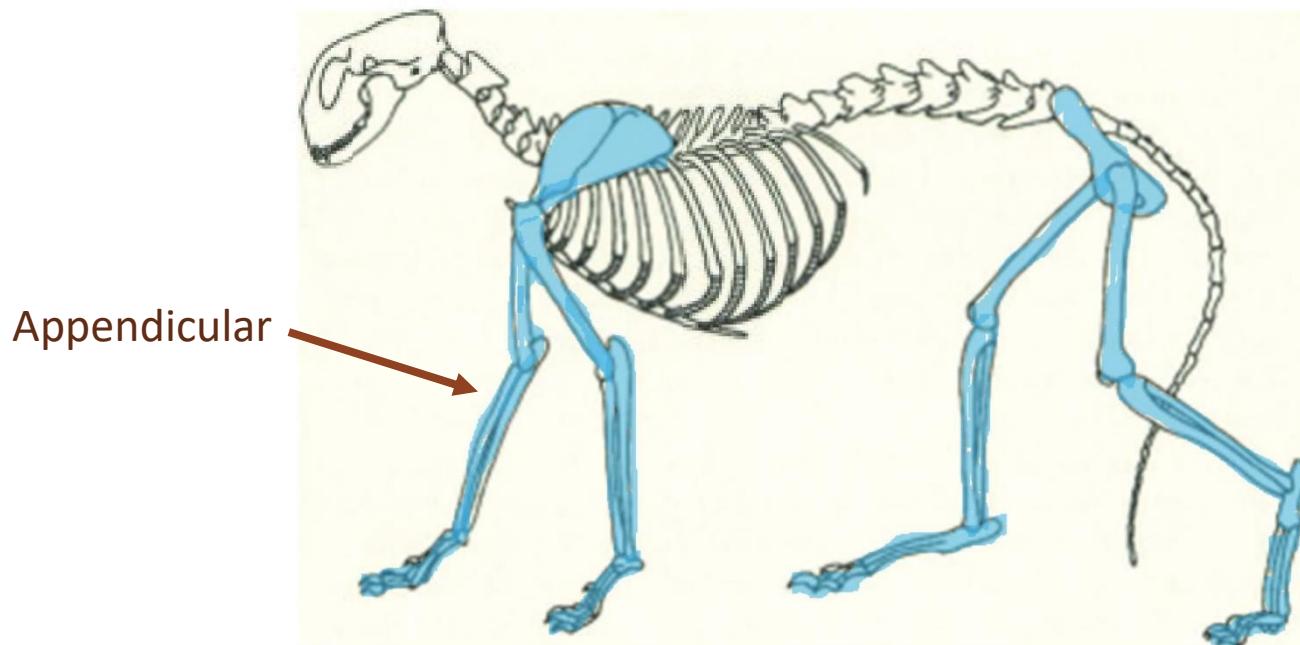
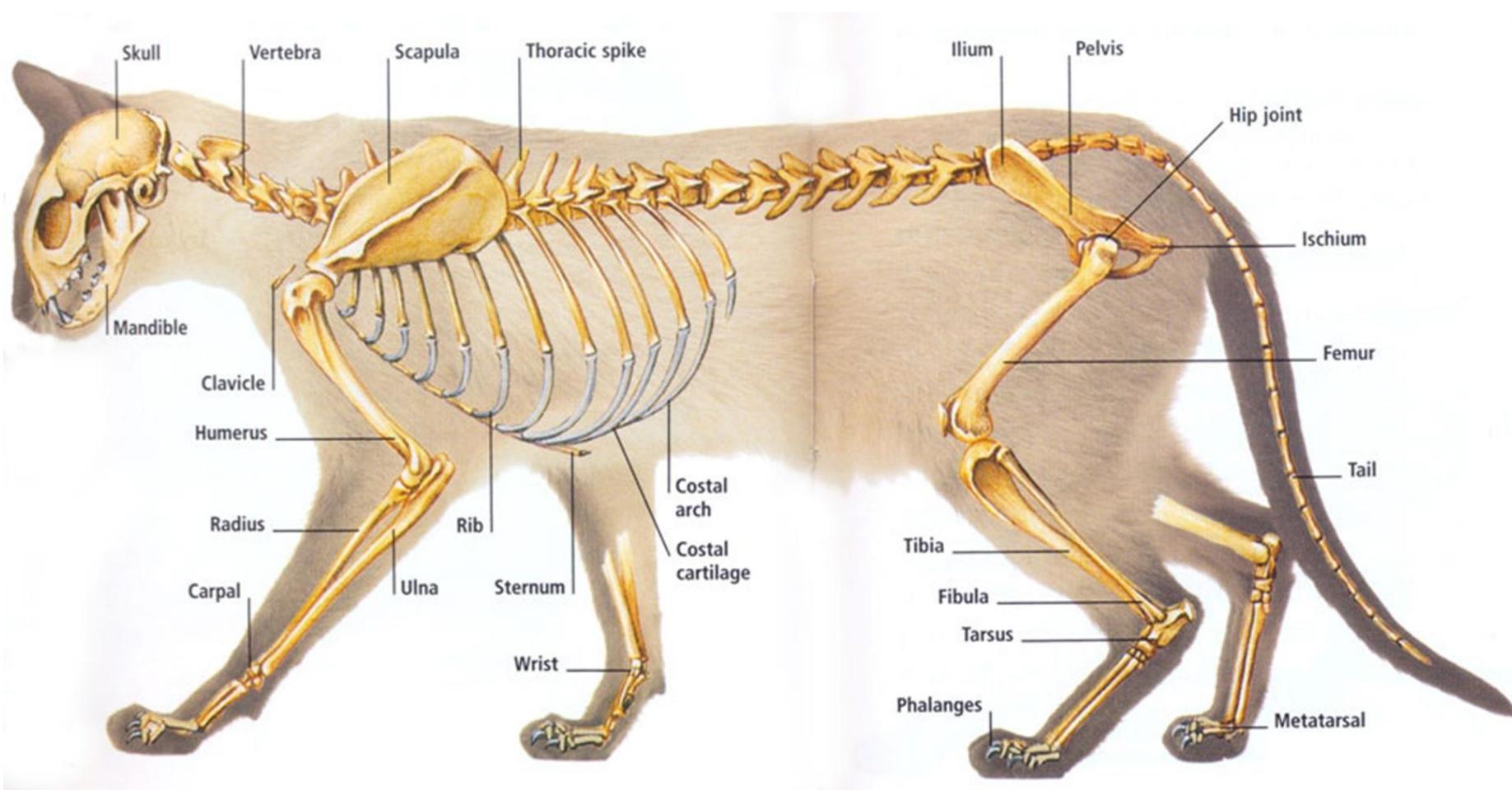


Figure 6.1.
A cat skeleton.



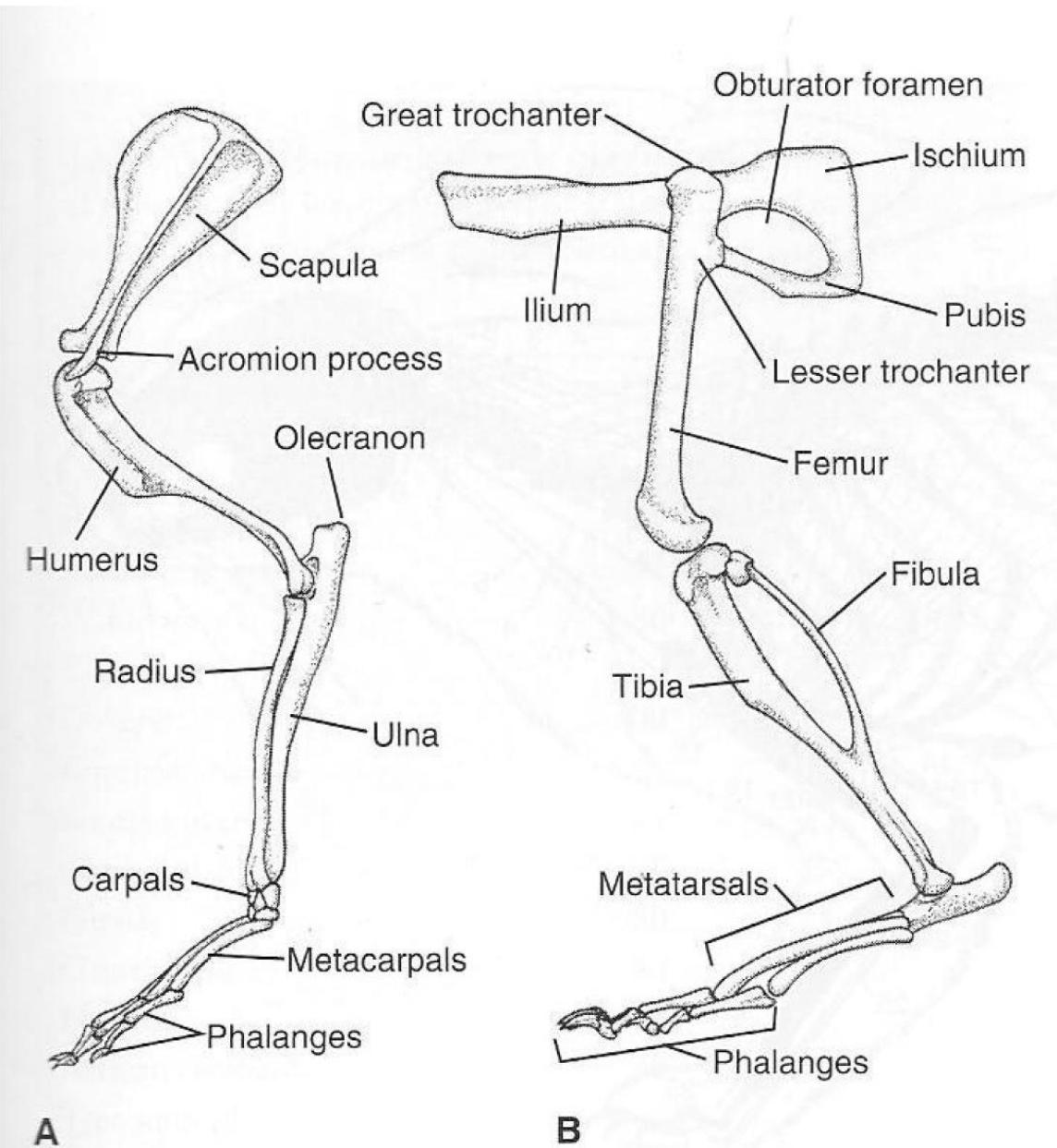


Figure 5.10 Pectoral and pelvic girdles. The bone patterns of (A) the pectoral and (B) pelvic girdles and the forelimbs and hind limbs for the Norway rat (*Rattus norvegicus*). Each in-

Modified Limbs



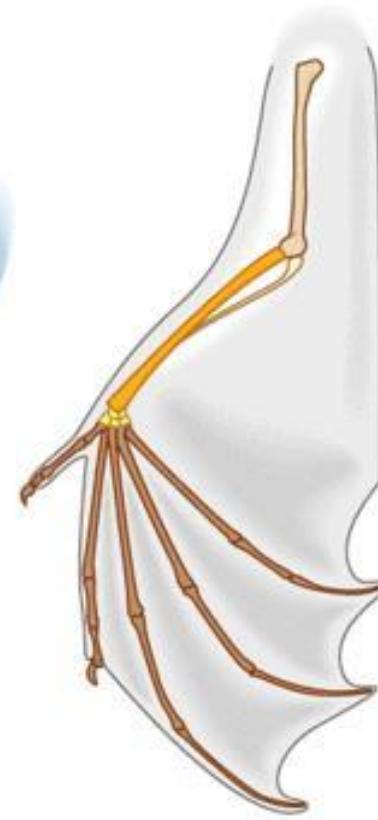
Human



Cat

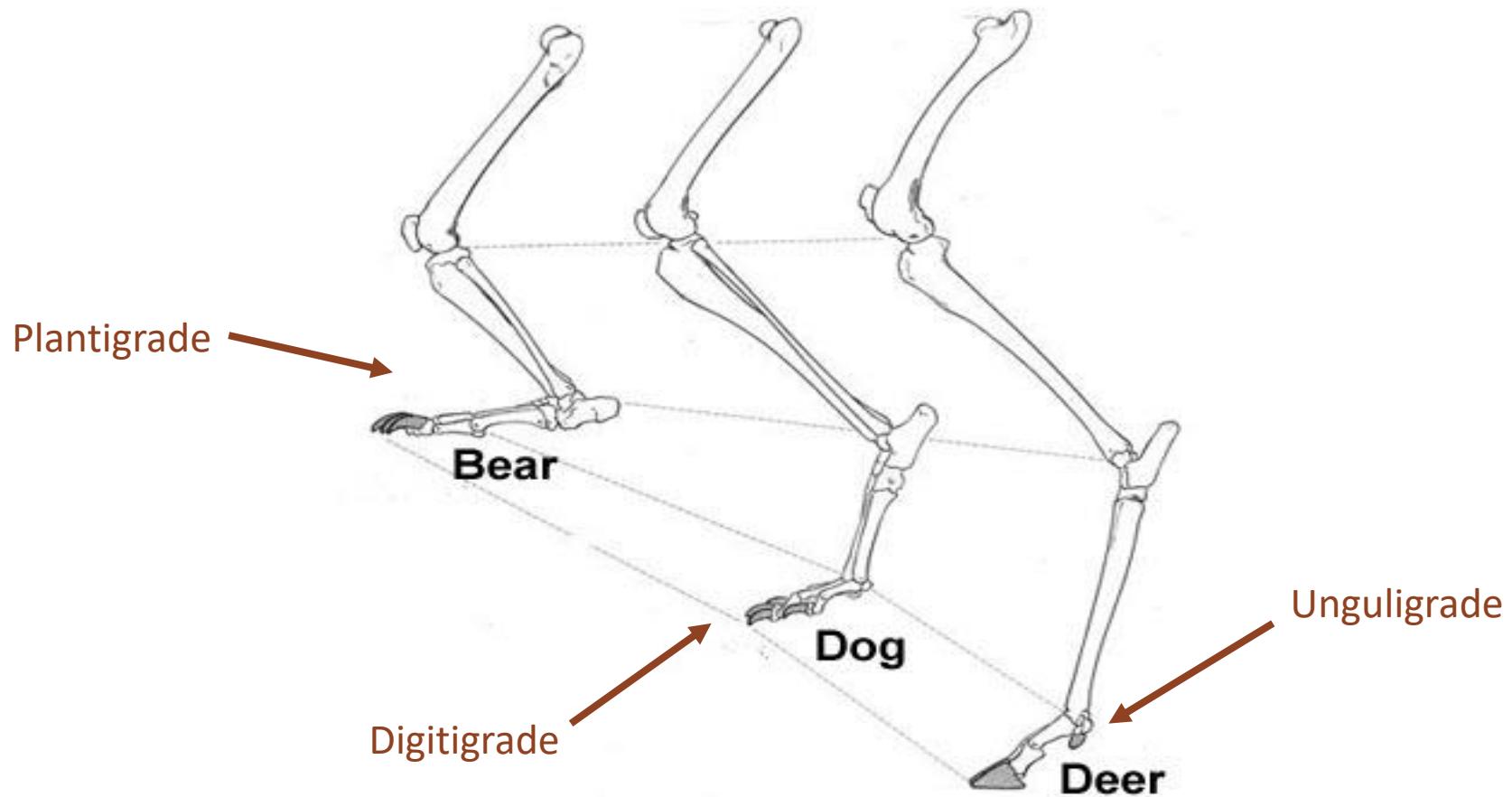


Whale

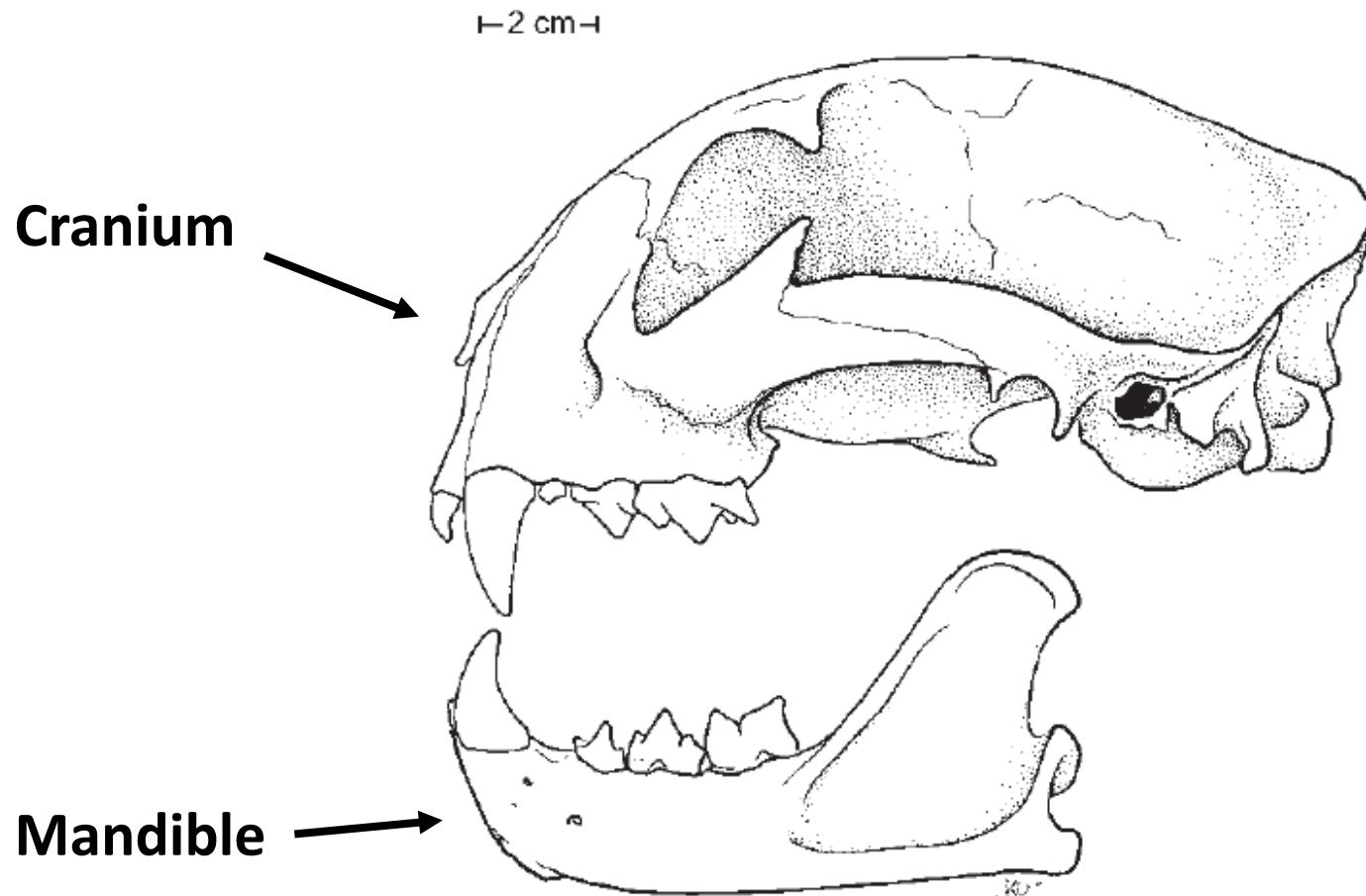


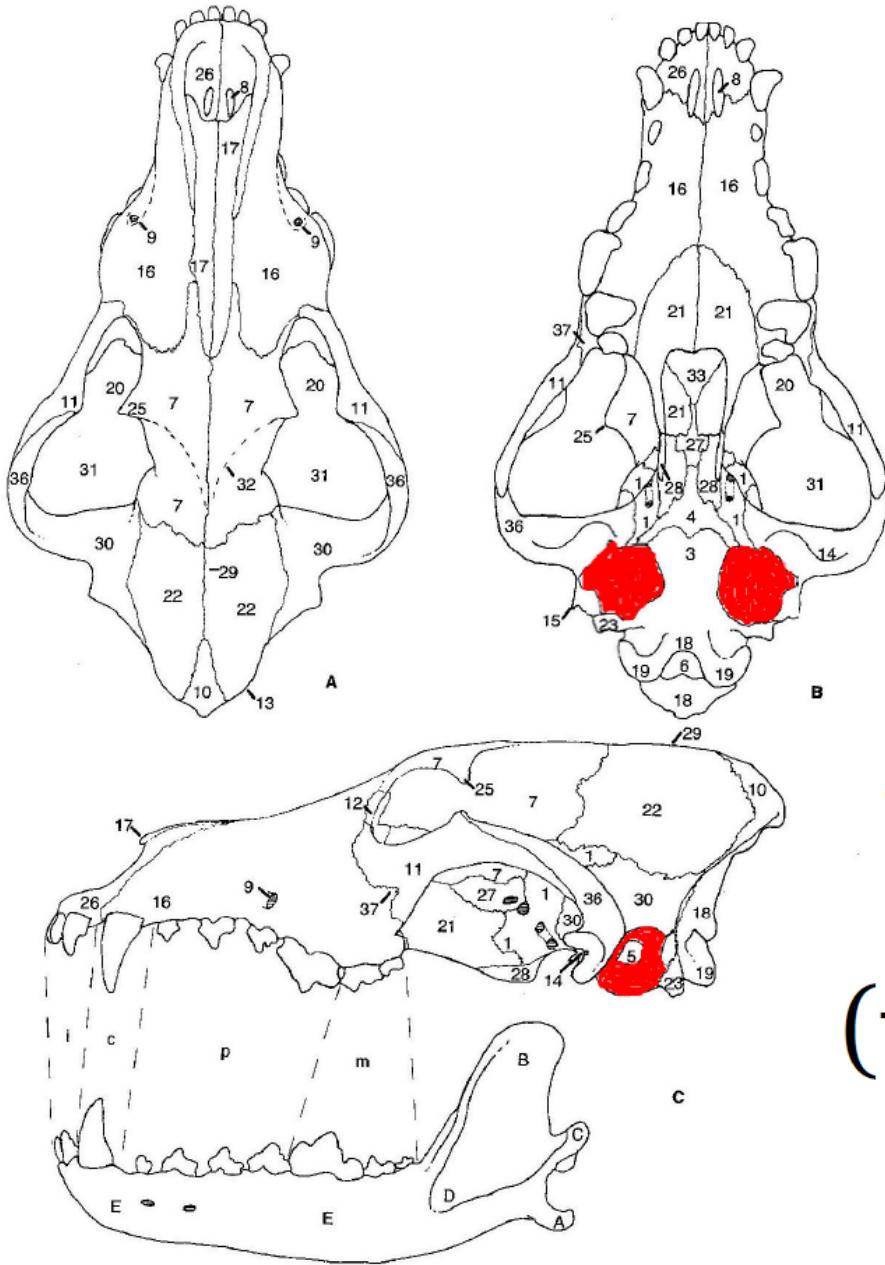
Bat

Position of Feet



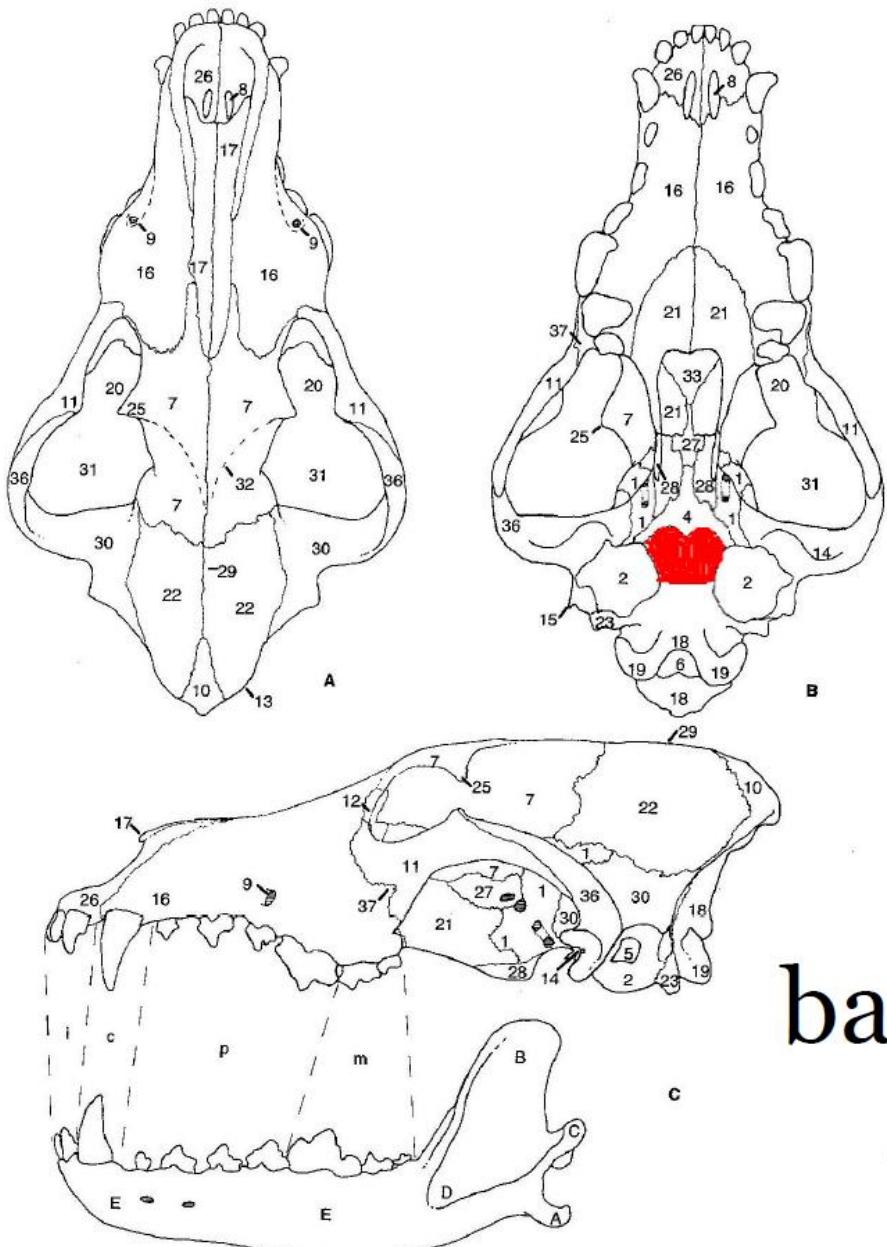
Skull Basics





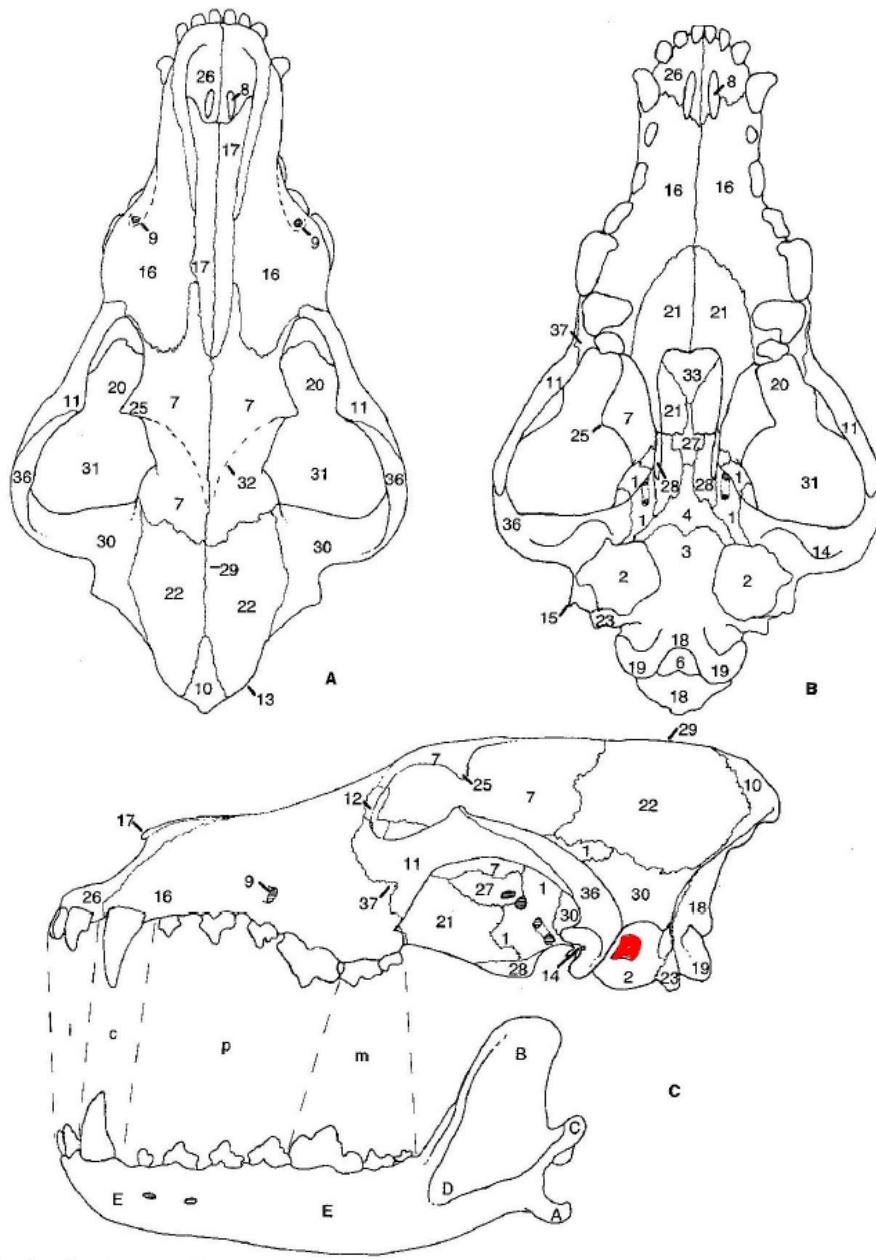
auditory bulla (tympanic bone)

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).



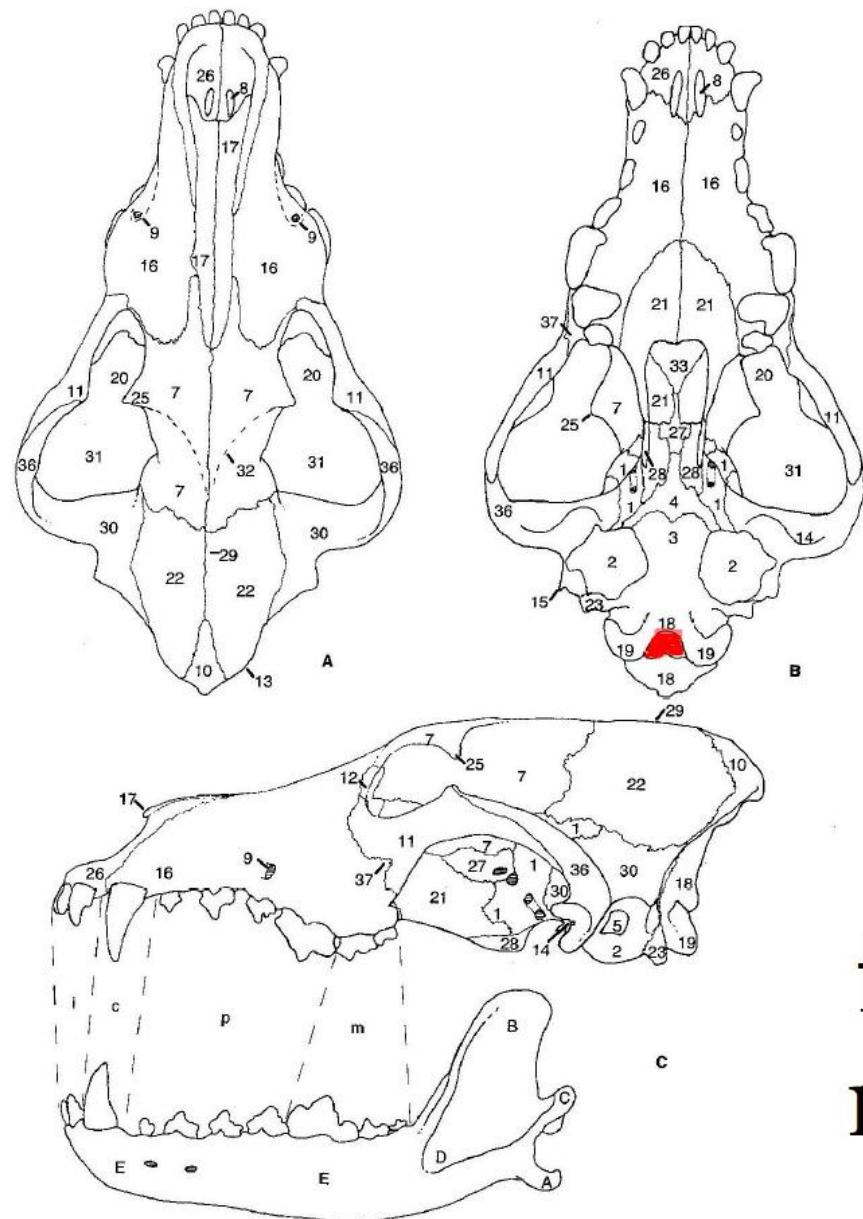
basioccipital

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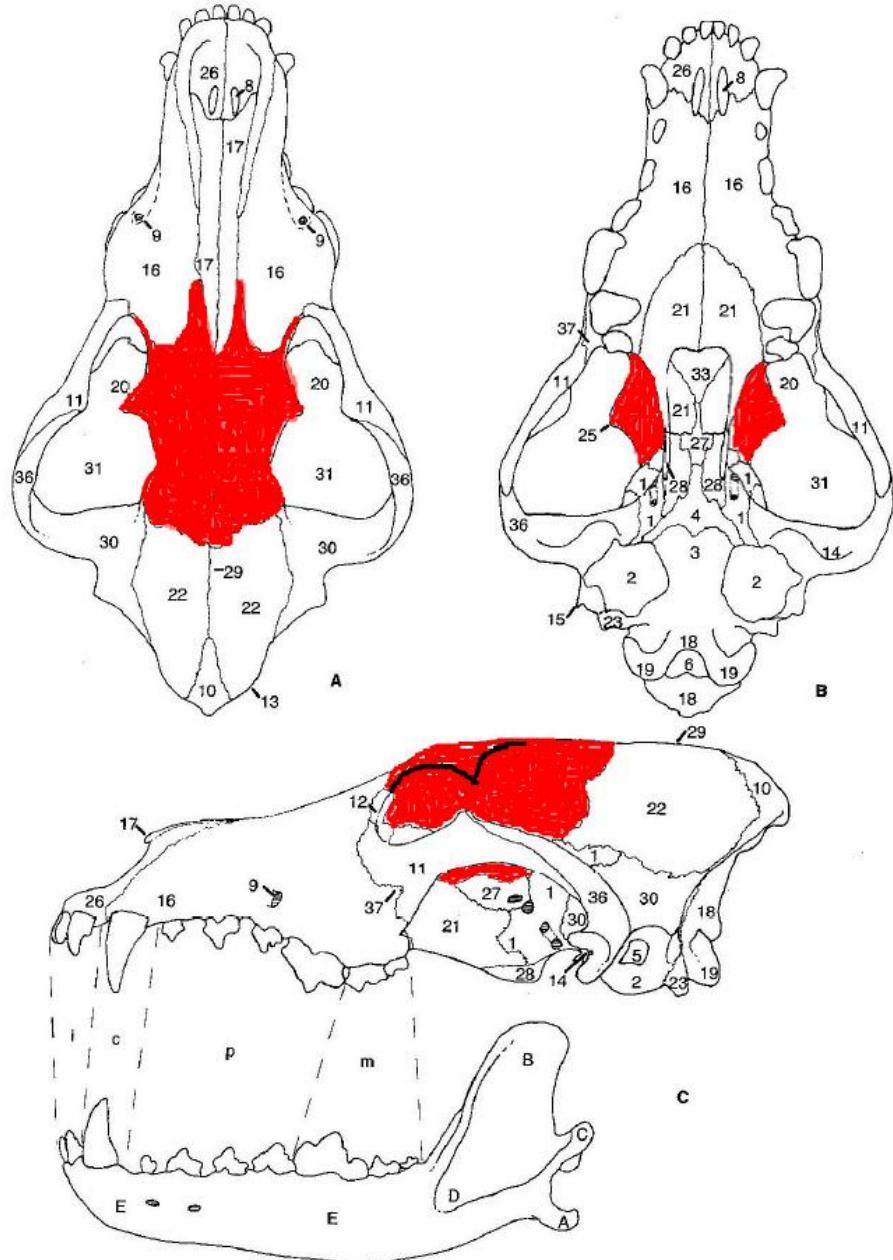
external auditory meatus

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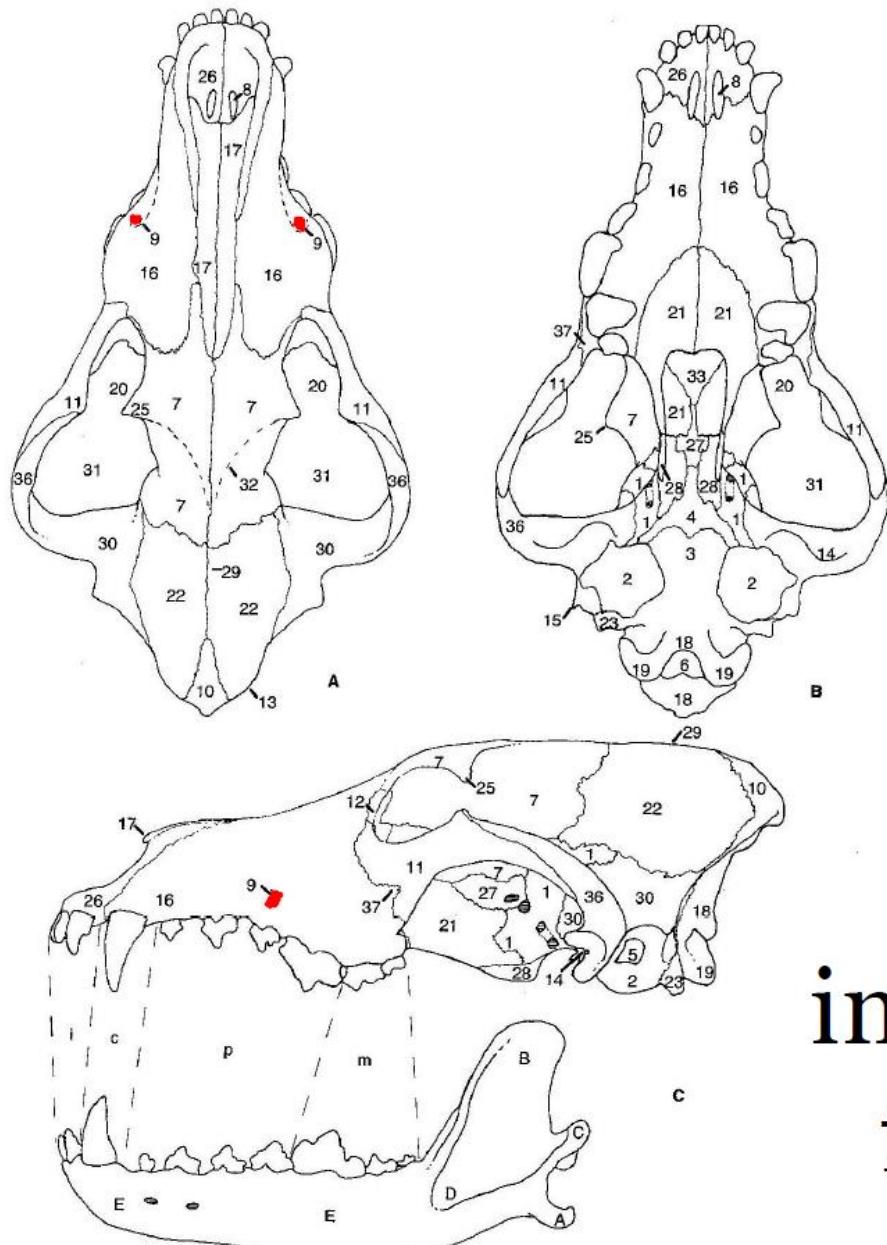
foramen magnum

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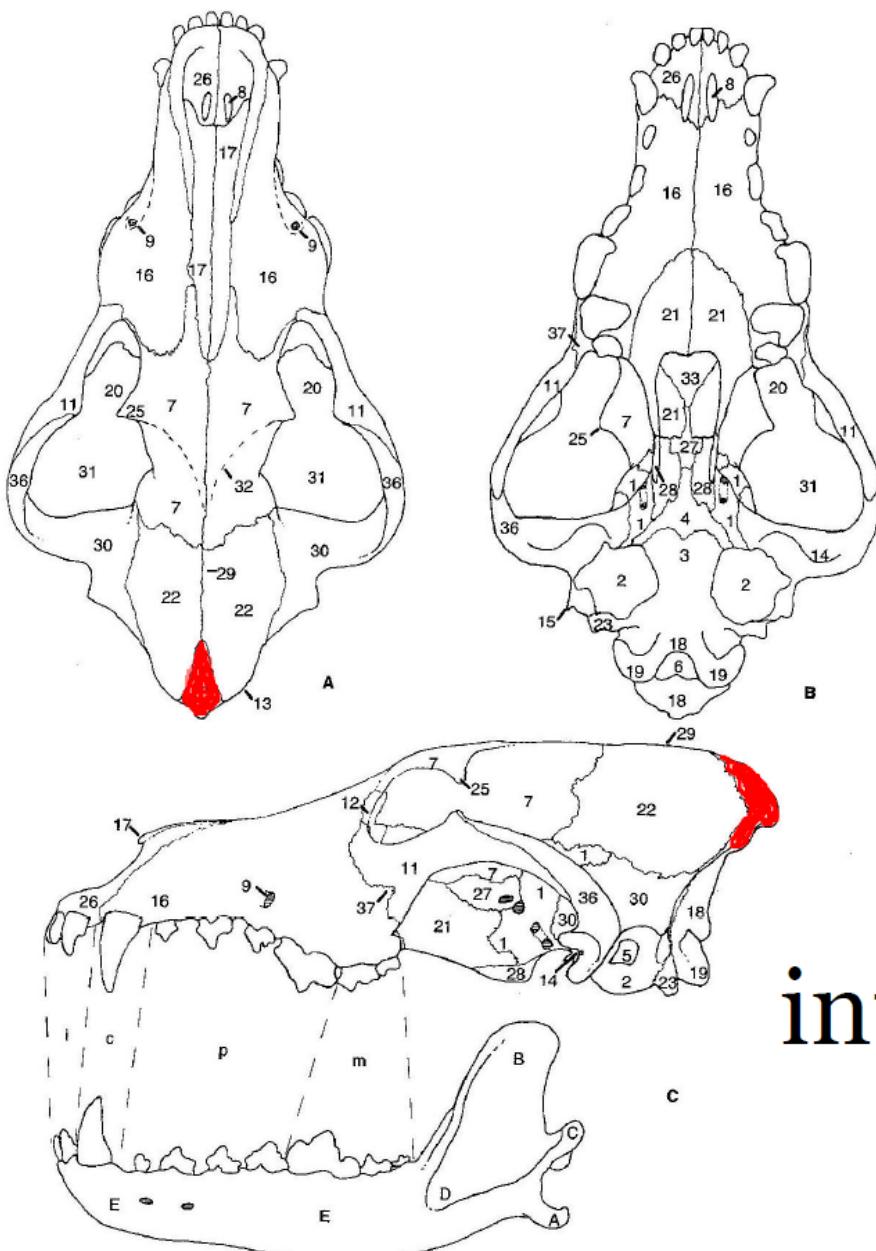
frontal

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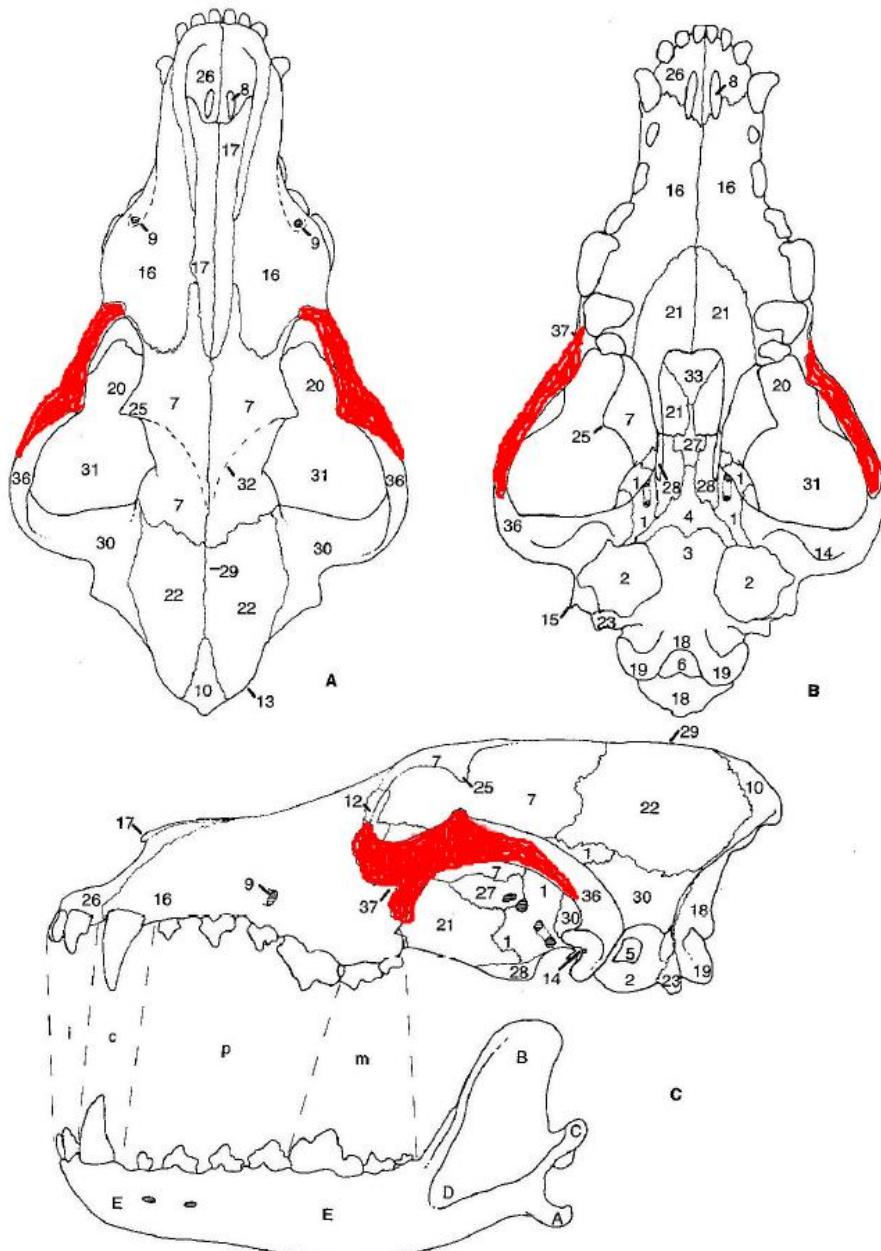
infraorbital foramen

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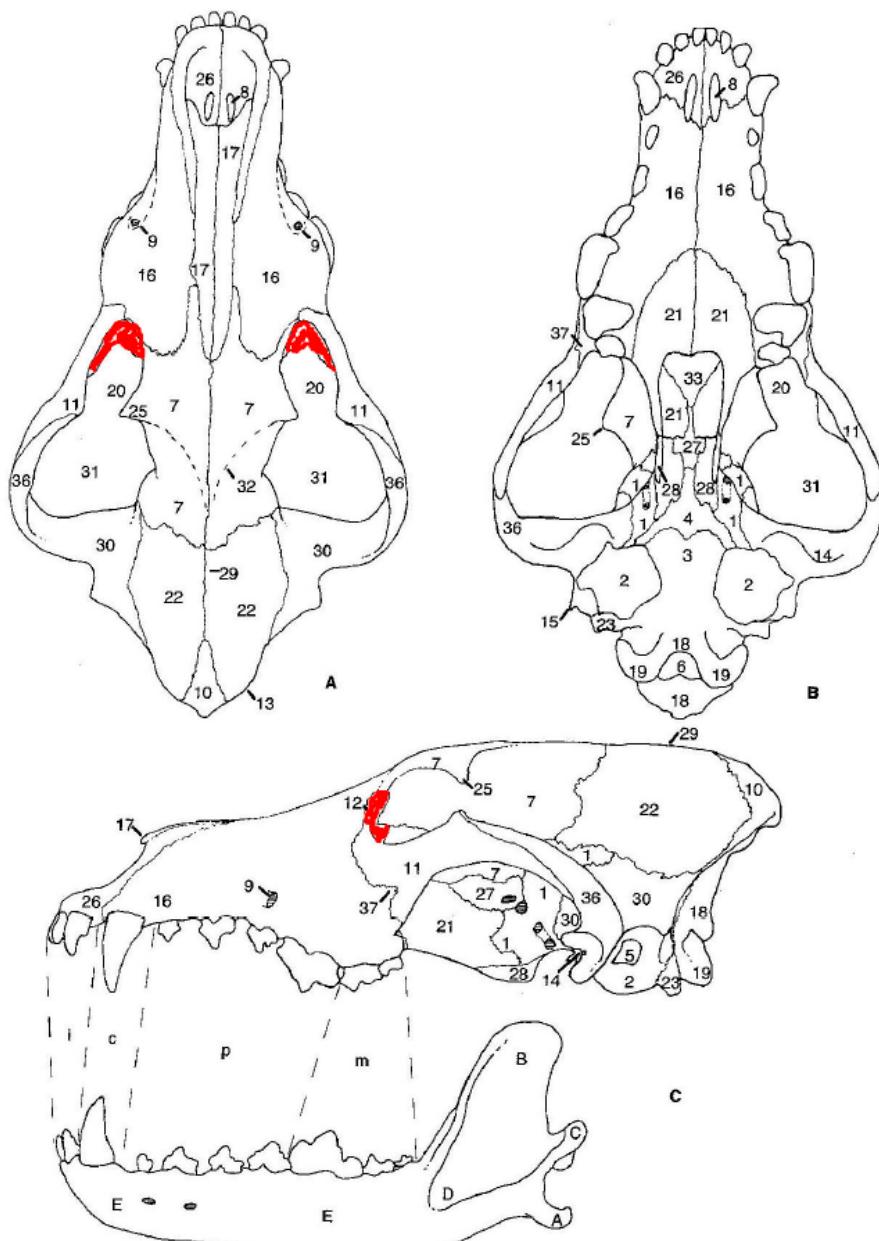
interparietal

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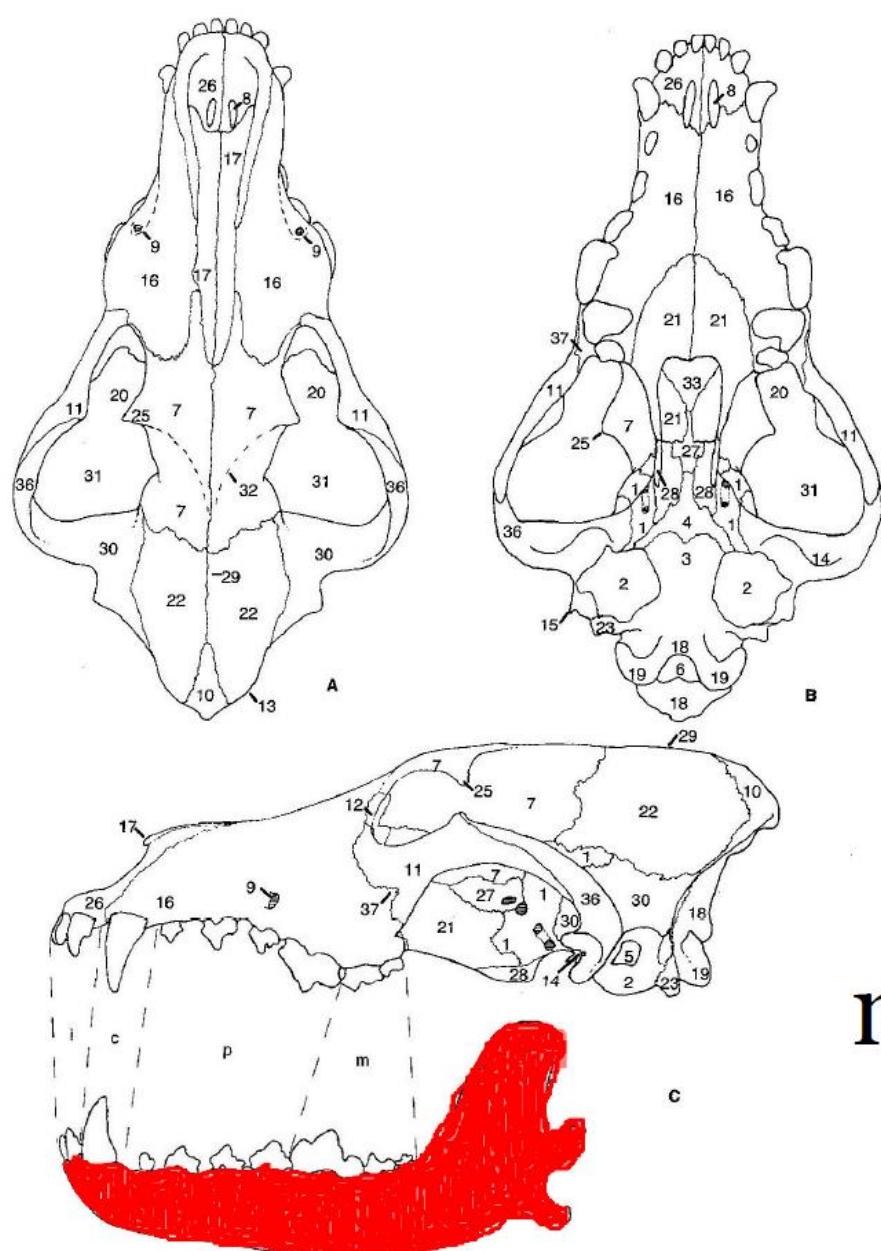
jugal

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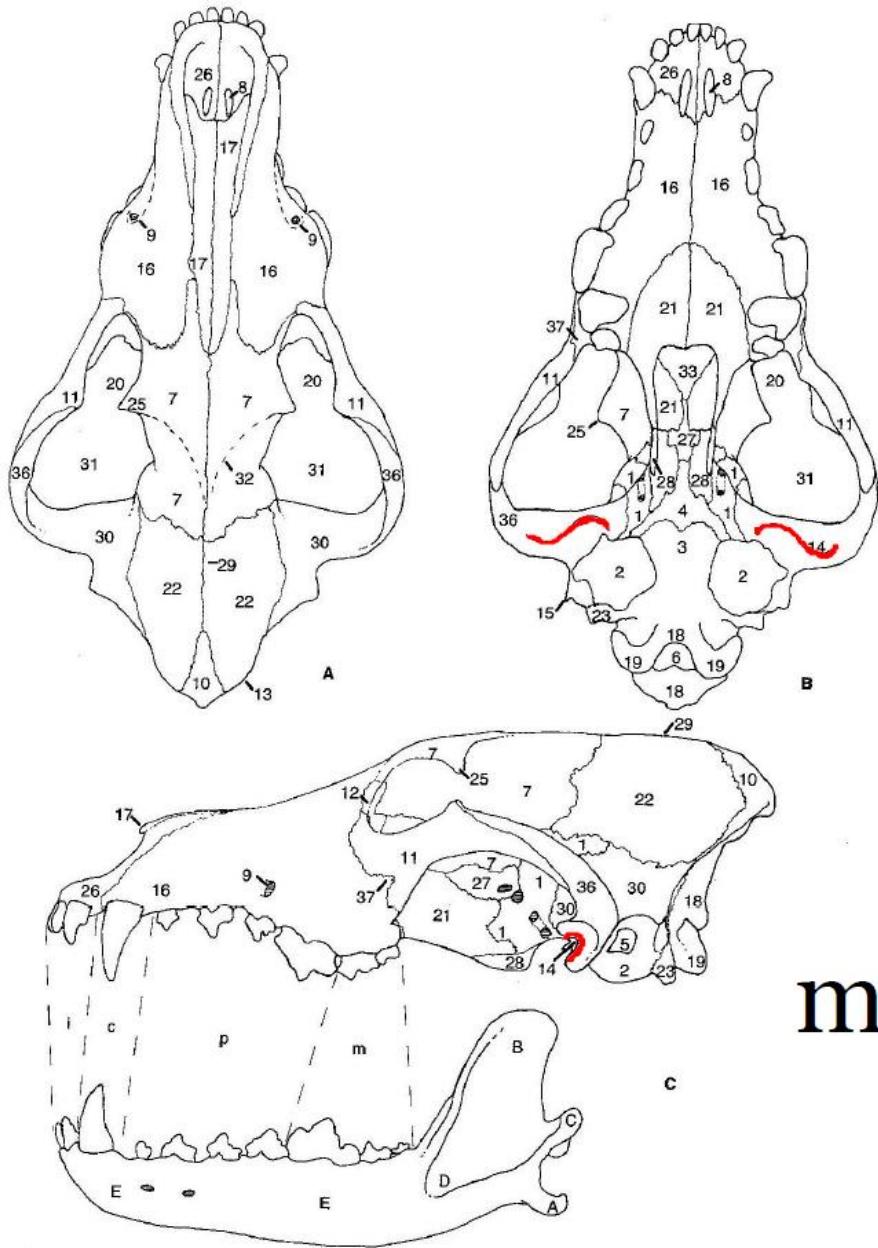
lacrimal

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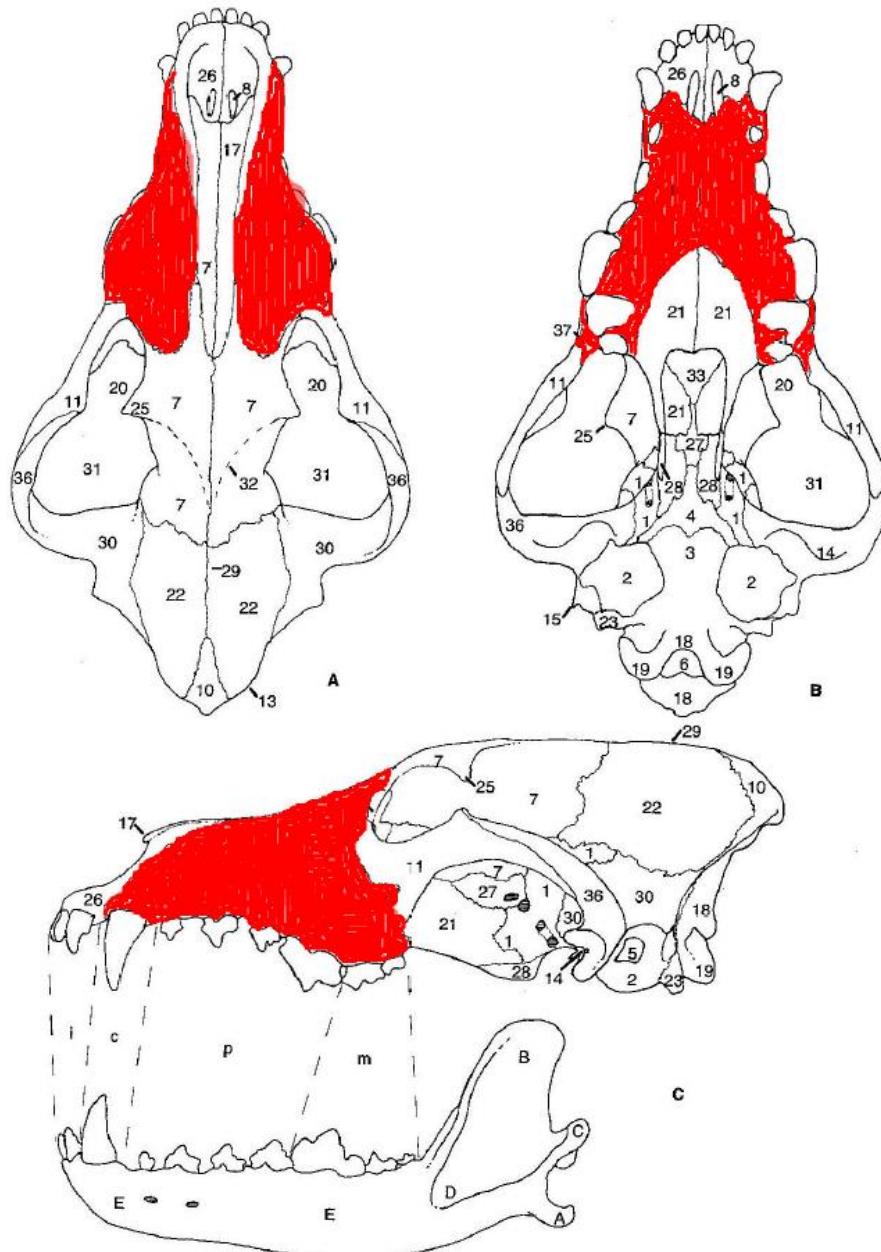
mandible

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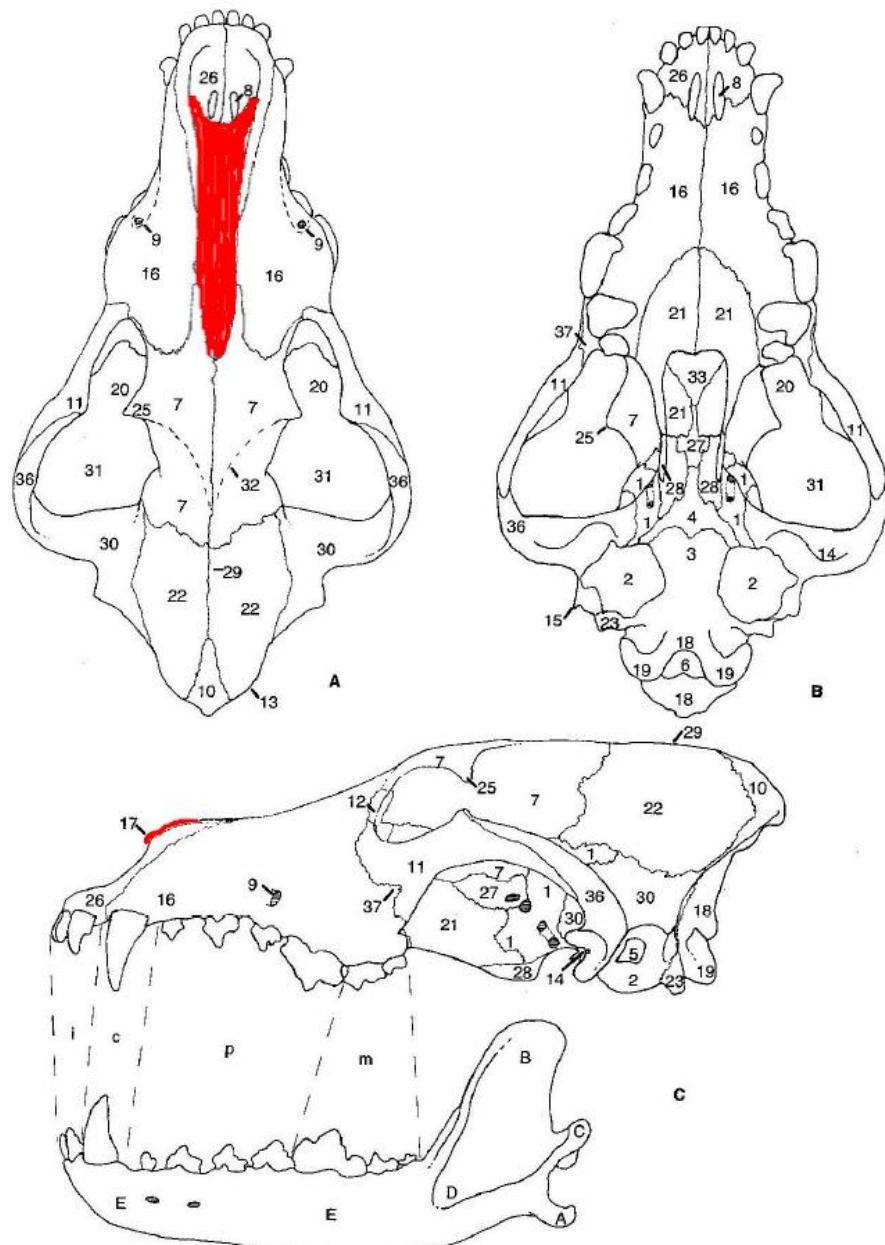
mandibular fossa

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).



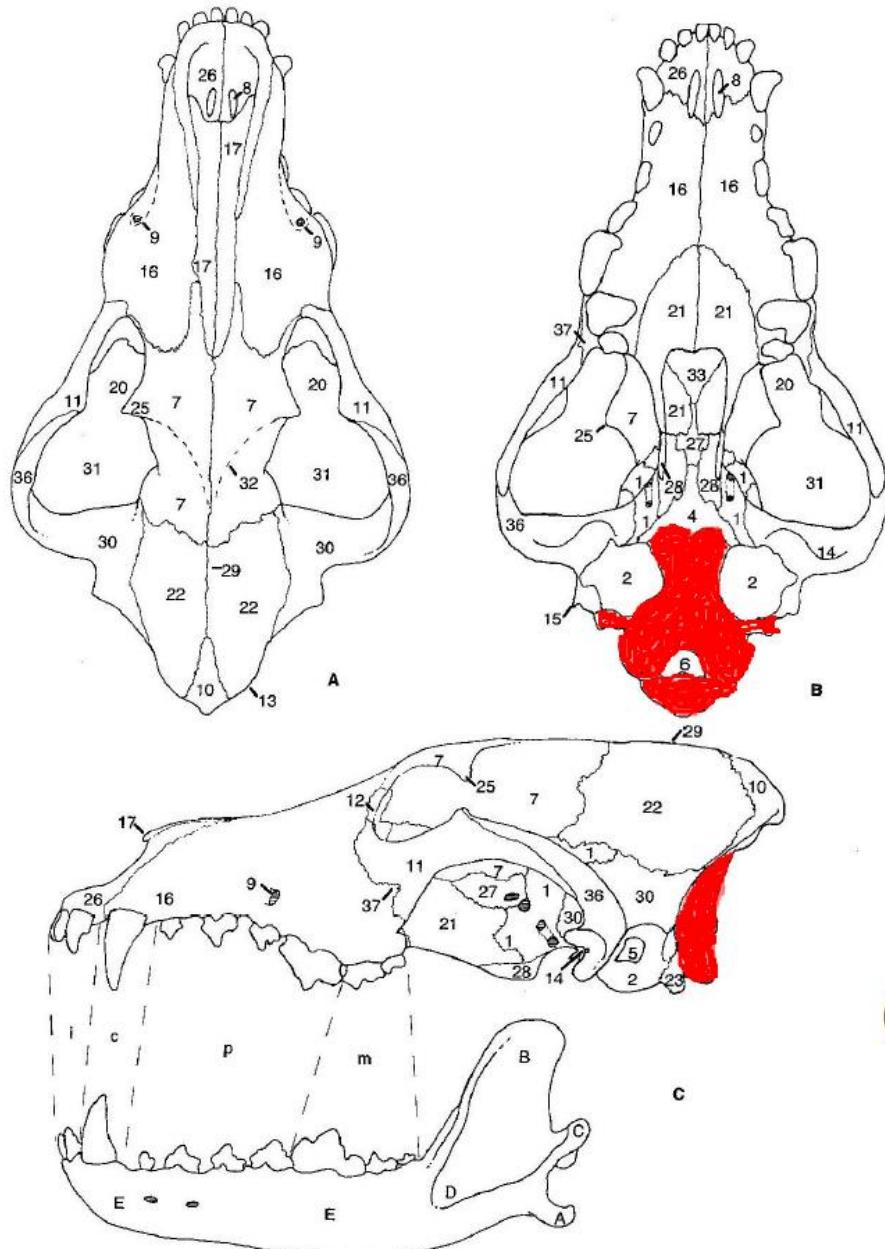
maxilla

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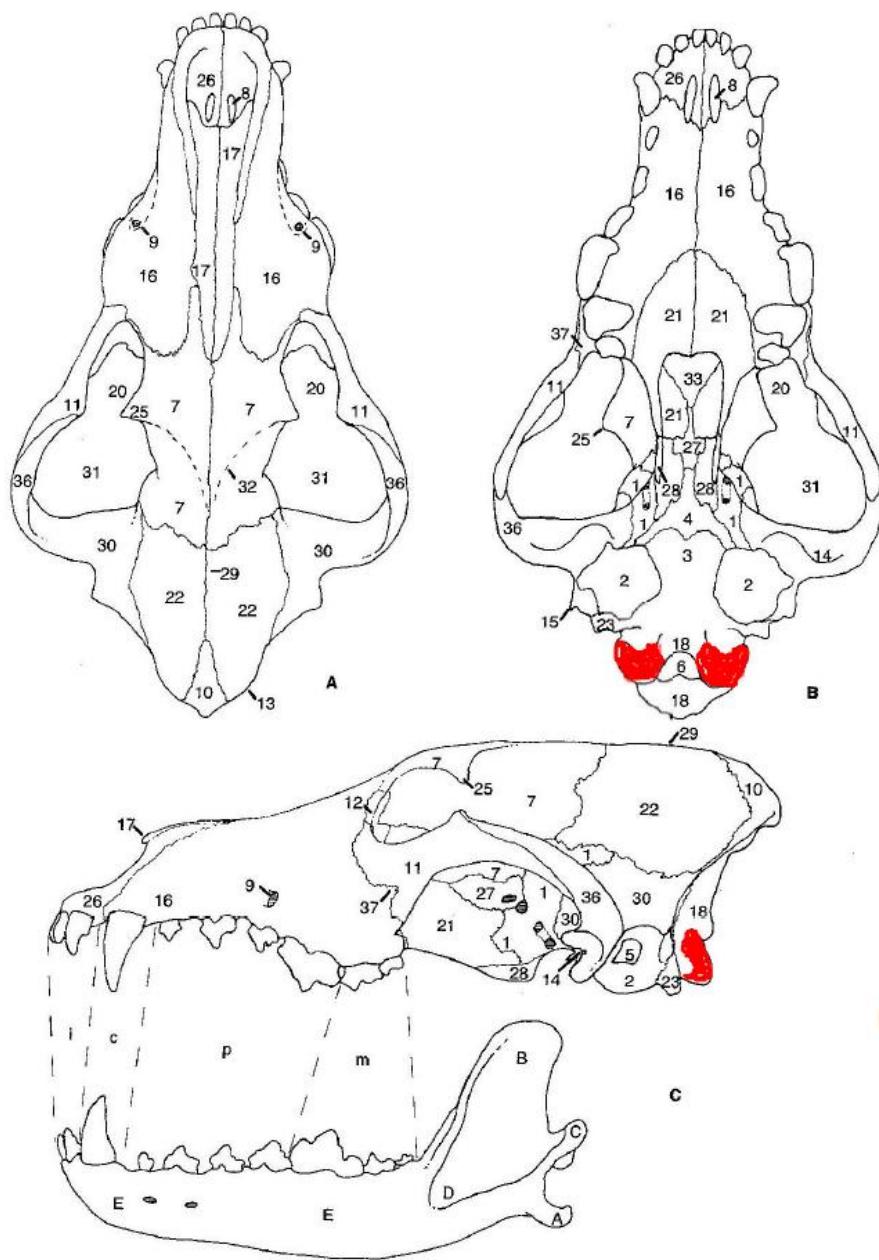
nasal
bone

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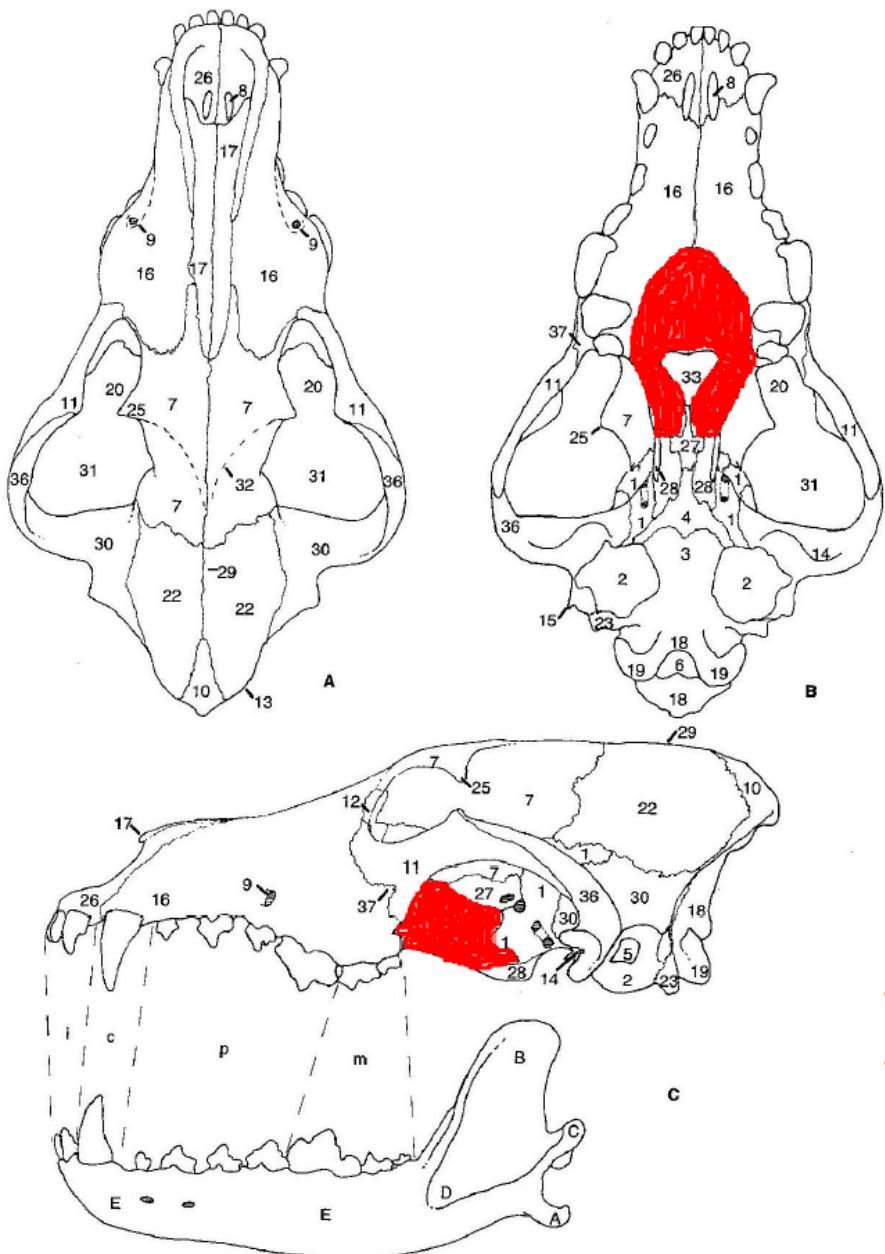
occipital bone

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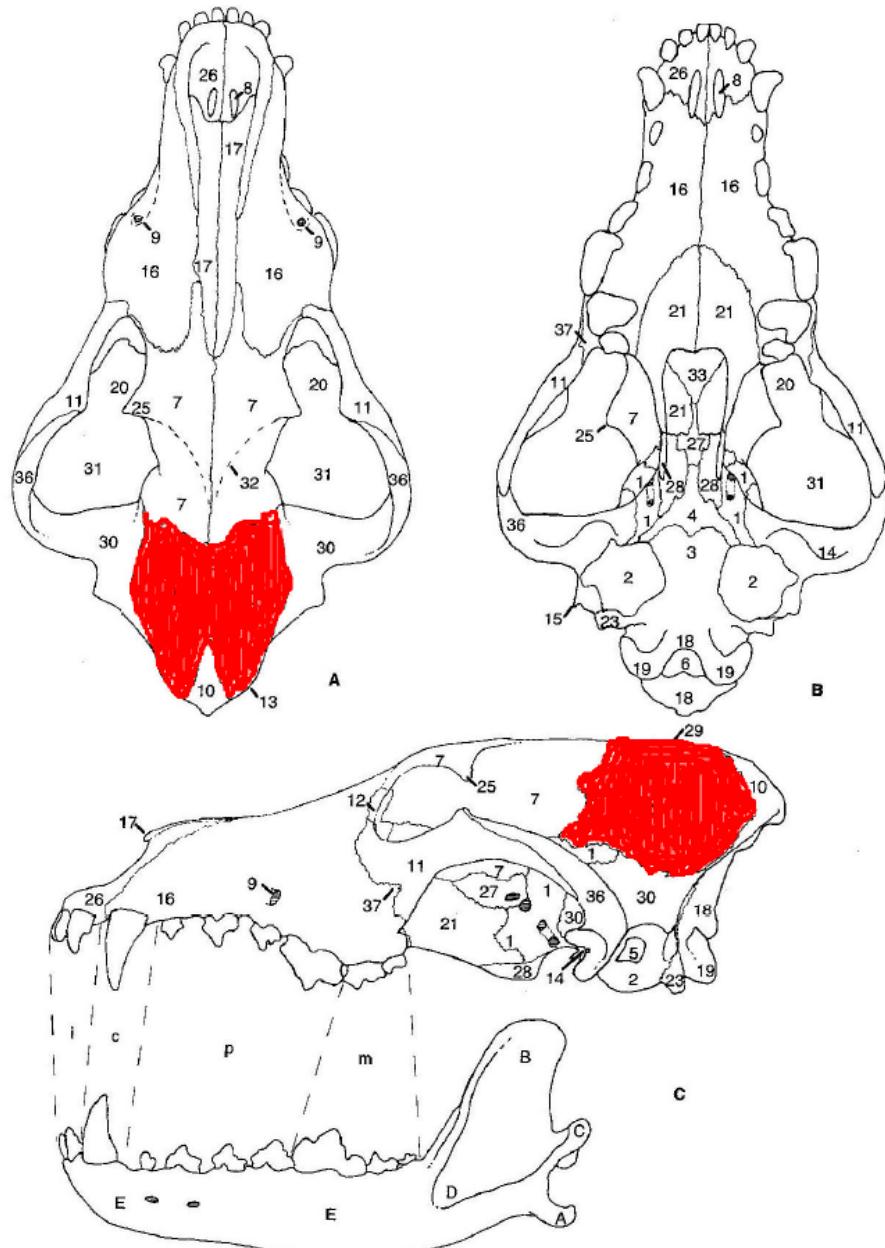
occipital condyle

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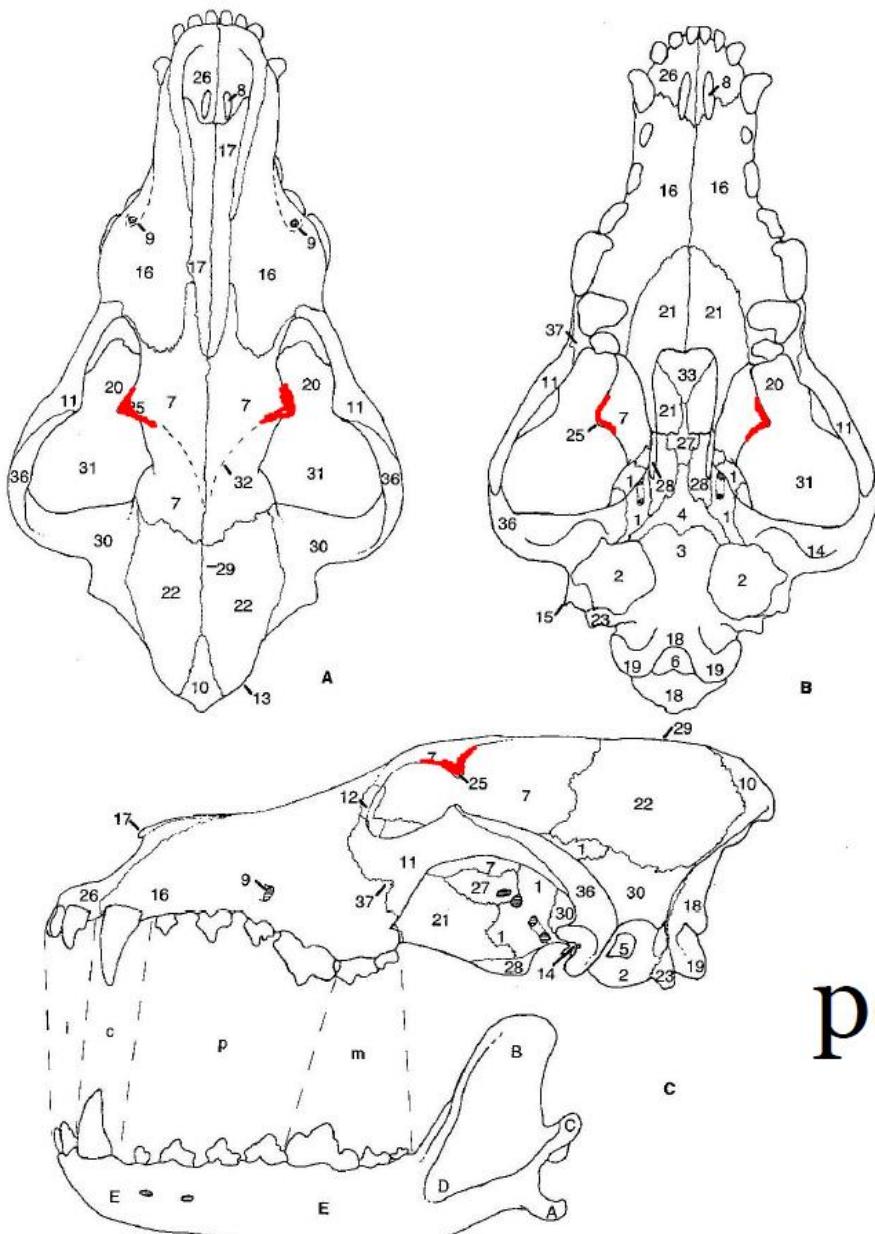
palatine

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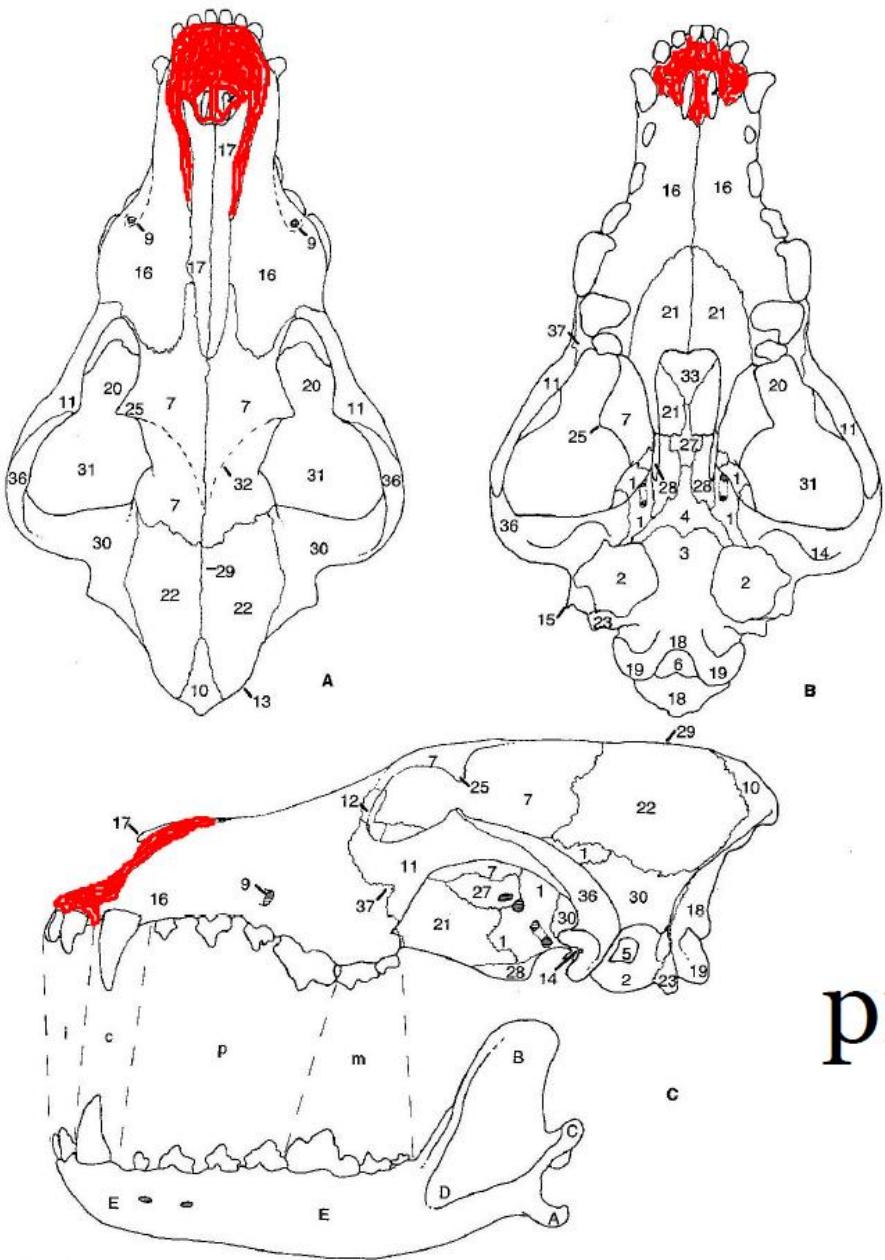
parietal

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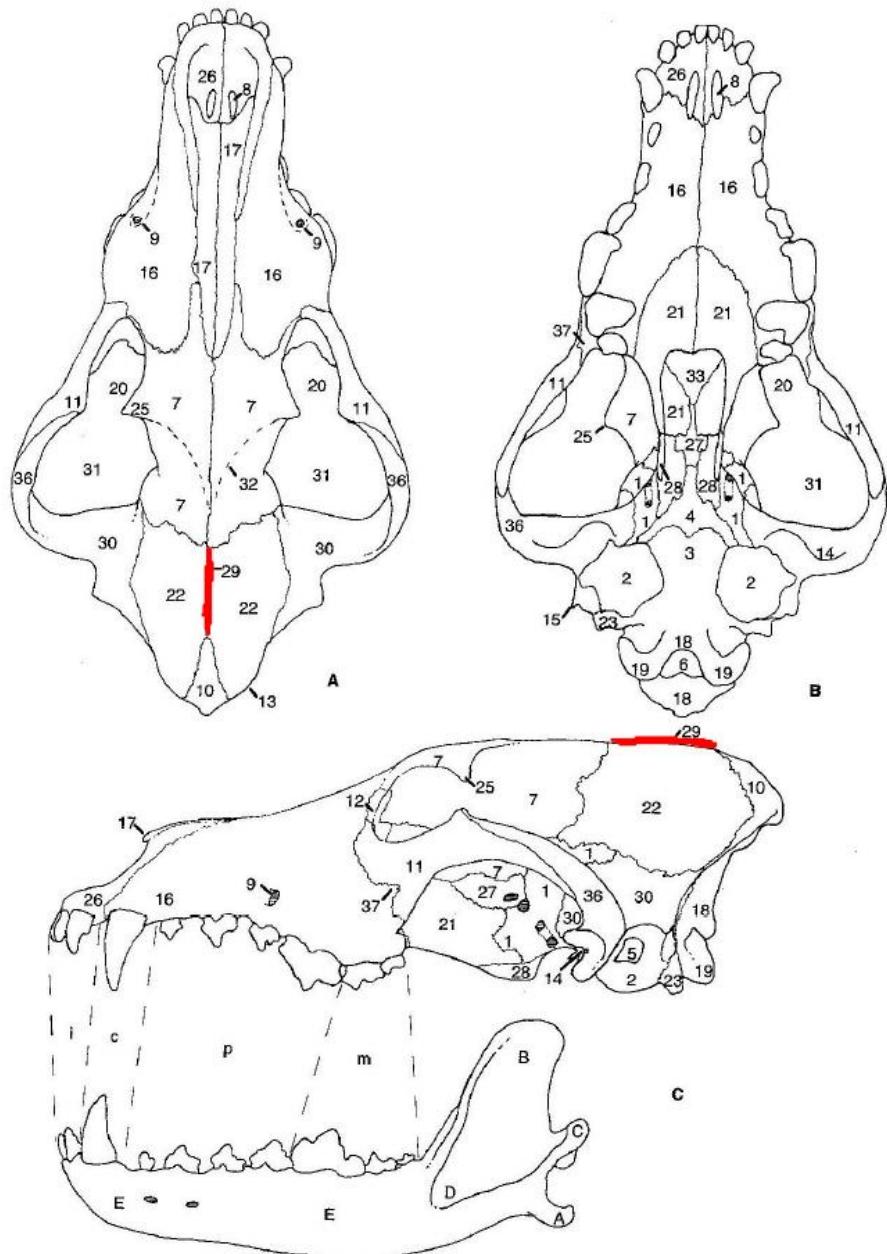
postorbital process

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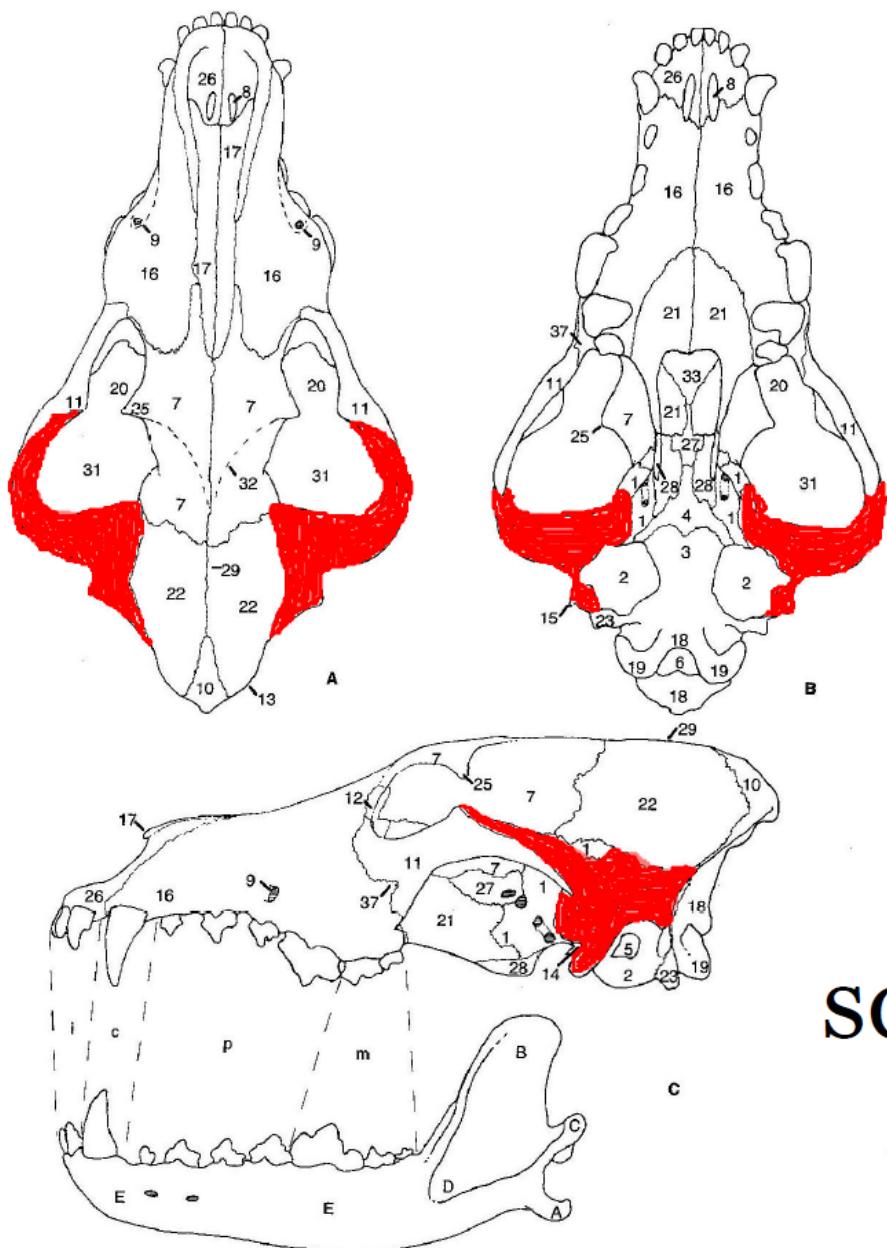
premaxilla

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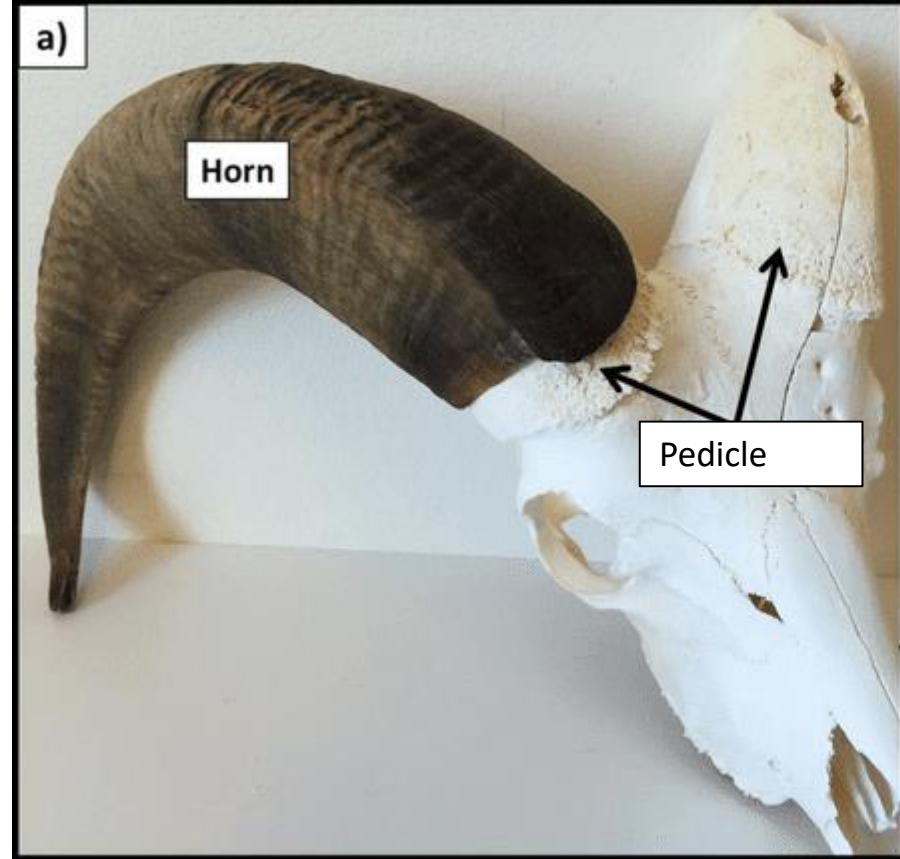
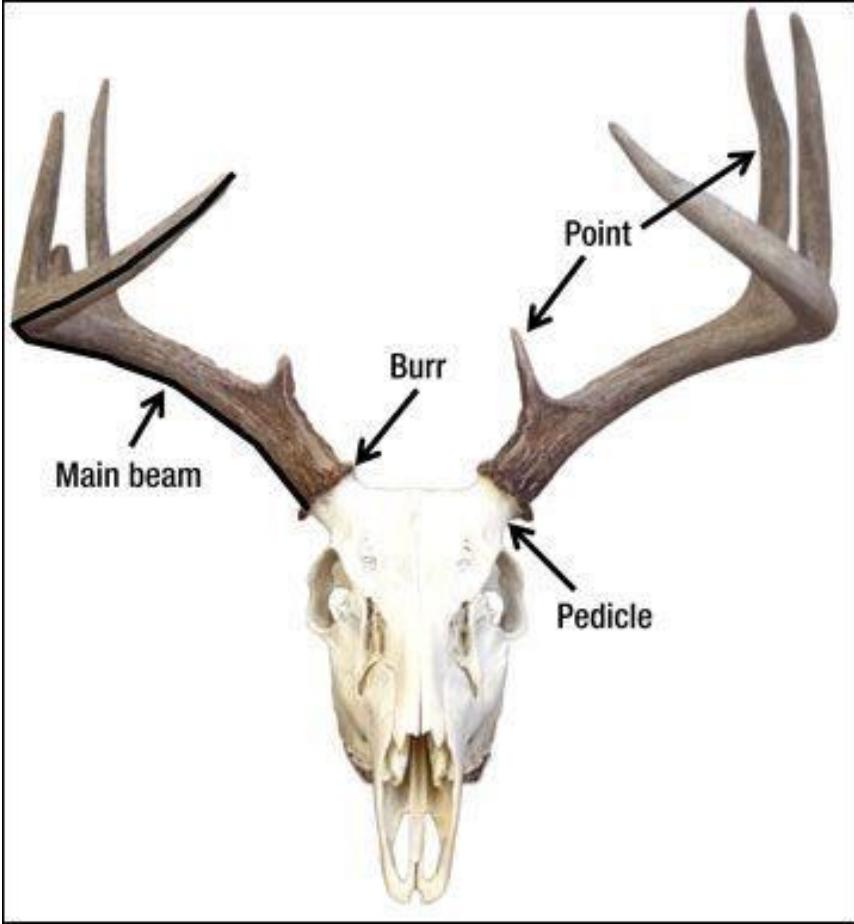
sagittal crest

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squamosal

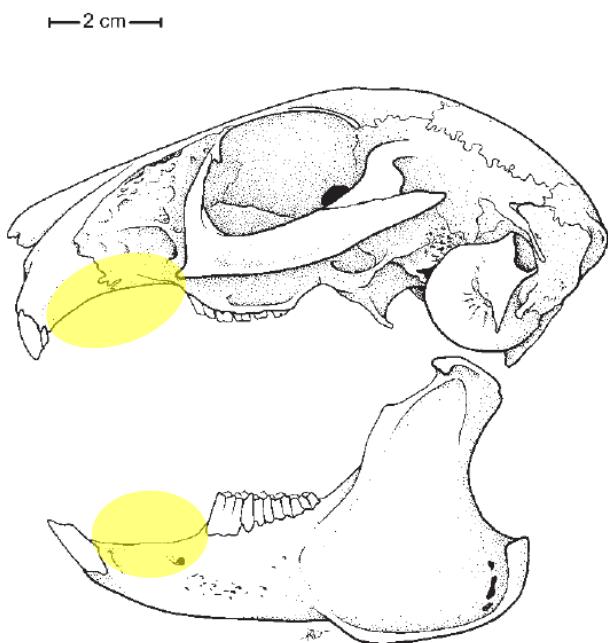
Fig. 1. Cranium and left mandible of *Canis*. A, dorsal view; B, ventral view; C, left lateral view. See page 7 for key to features (modified after DeBlase and Martin, 1981).



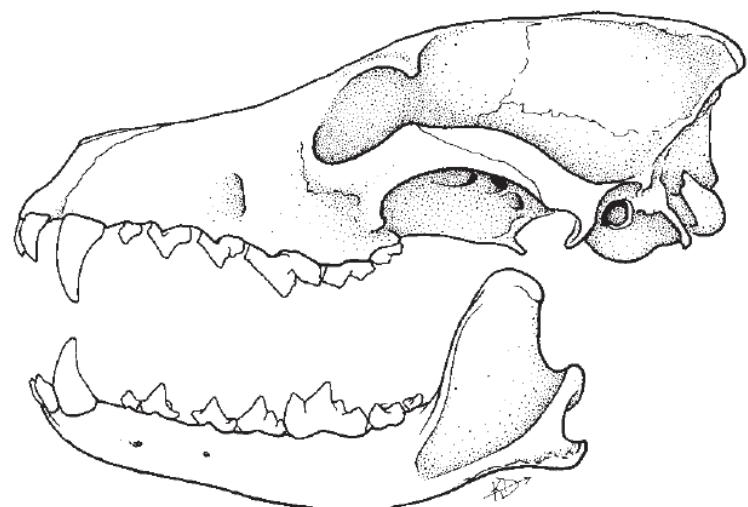
- Pedicle – a protuberance of the frontal bone of the skull found among many ungulates that supports horn or antler growth

Parts of the Skull:

Diastema



No diastema

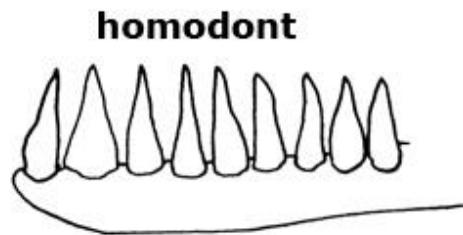


VS

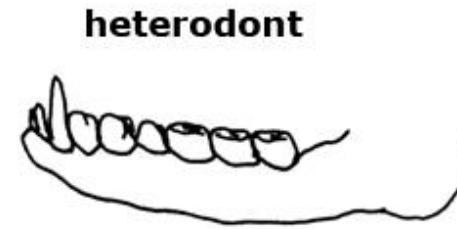
Artiodactyla, Perissodactyla, Lagomorpha,
Rodentia

Soricomorpha, Didelphimorphia,
Carnivora, Chiroptera

Teeth Patterns



homodont



heterodont

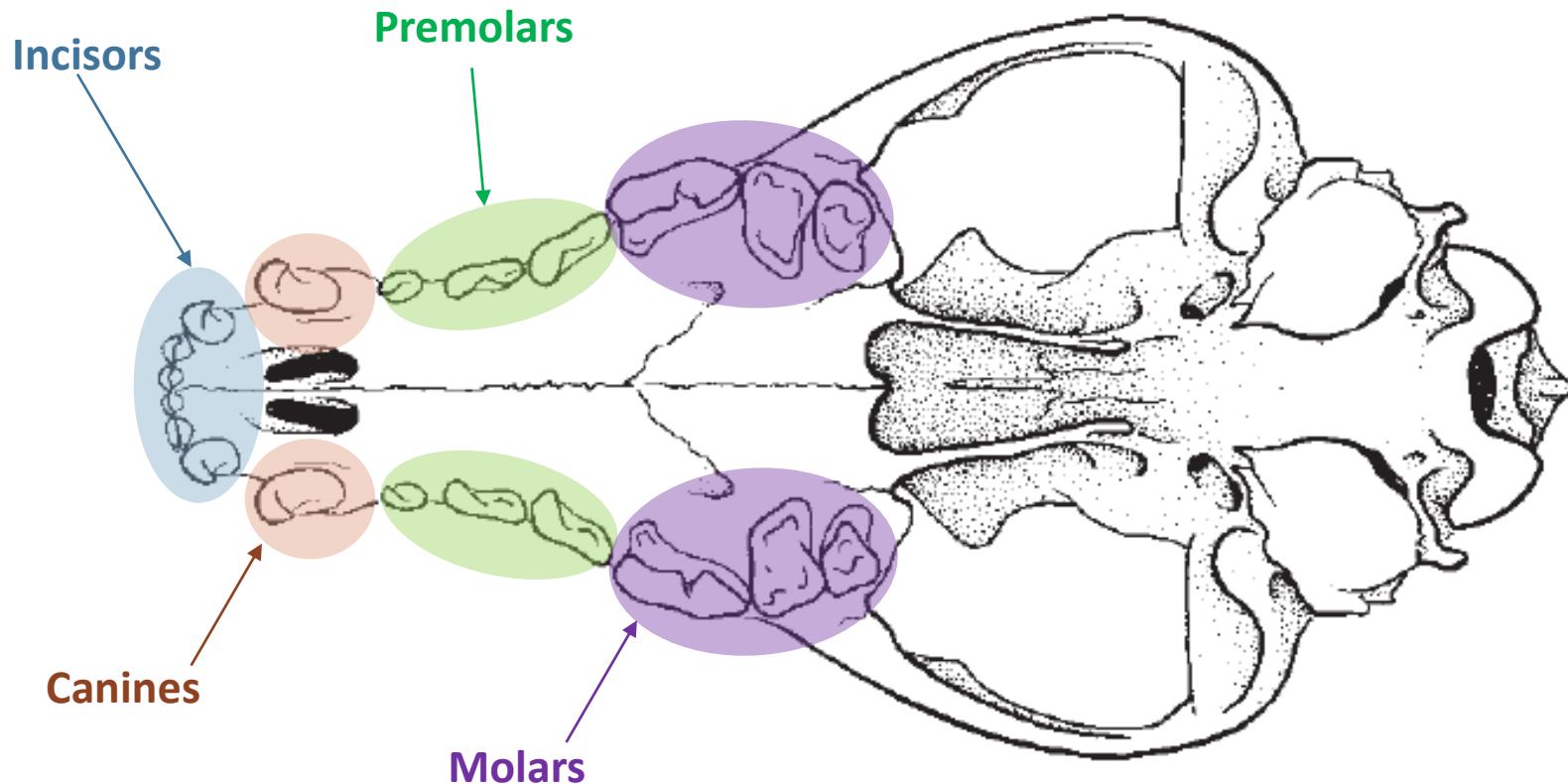
- Homodont

- 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



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



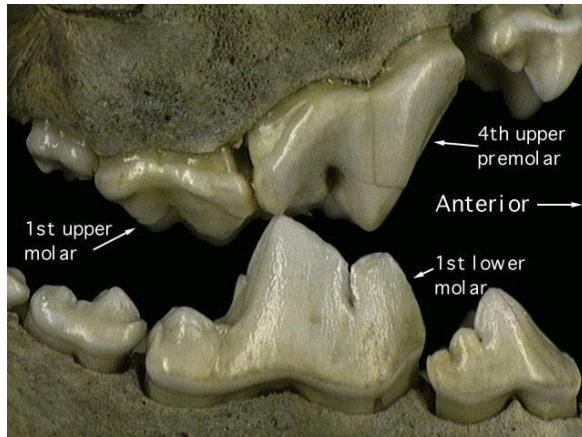
Molars

- 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





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What about elephant tusks?

Heterodonts



fine art
america

Incisors!

Heterodonts

Occlusal Patterns

- Occlusal Patterns – the forms of the outside of the teeth
- In particular, these occlusal patterns or forms describe the shape of the cusps on the premolars and molars
- These shapes determine how food is masticated

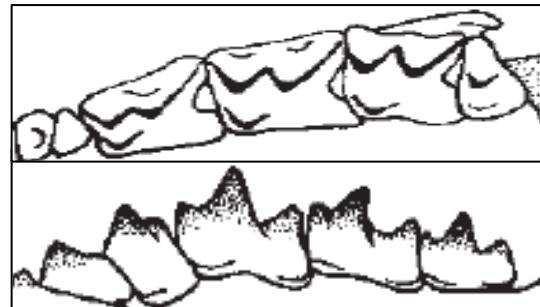
Occlusal Patterns

- Bunodont
 - Cusps of teeth with rounded or low conical shapes
 - Omnivores (e.g. Humans, Suidae)
- Selenodont
 - Cusps of teeth with crescents in grinding 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, Lagomorpha, 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)

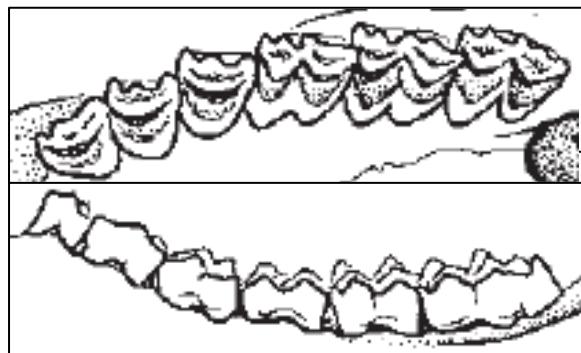
Bunodont – Black bear



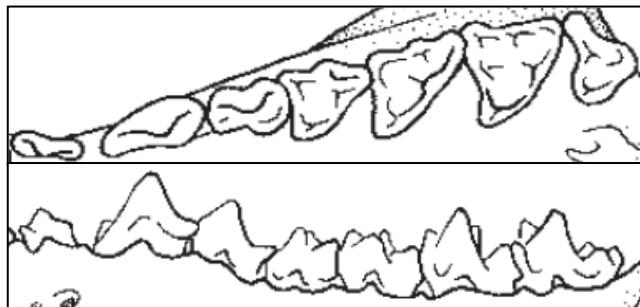
Dilambodont – Smoky Shrew



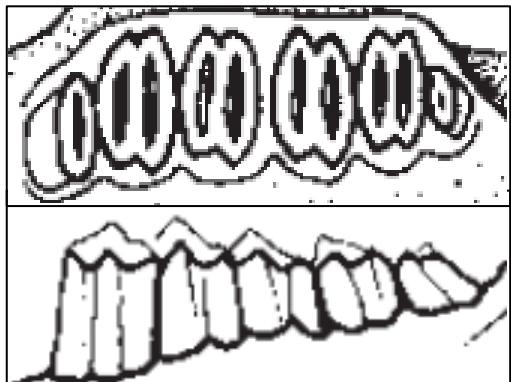
Selenodont – White-tailed Deer



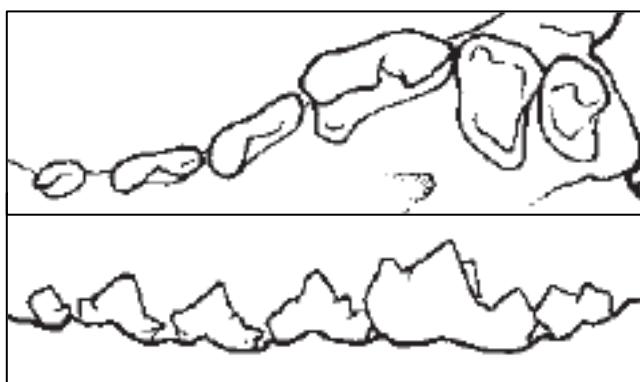
Tribosphenic – Virginia Opossum



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

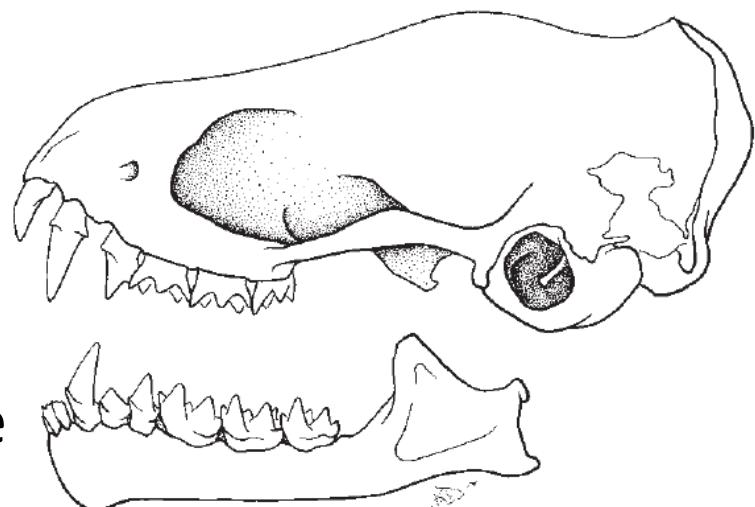
- Upper mandible/lower mandible

- Dental Formula :

$$I\ 1/2, C\ 1/1, P\ 1/2, M\ 3/3 = 14 \times 2 = 28$$

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

— 5 mm —

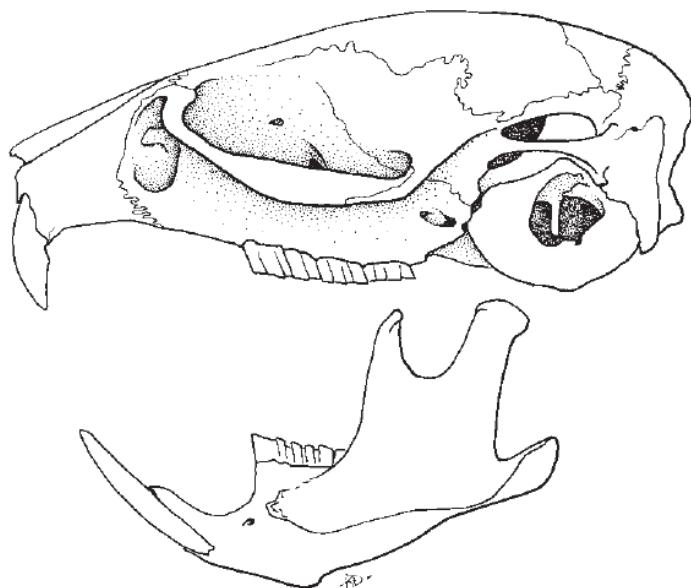


Tadarida brasiliensis (Mexican free-tailed bat) skull

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 :
 $I\ 1/1, C\ 0/0, P\ 0/0, M\ 3/3 = 8 \times 2 = 16$

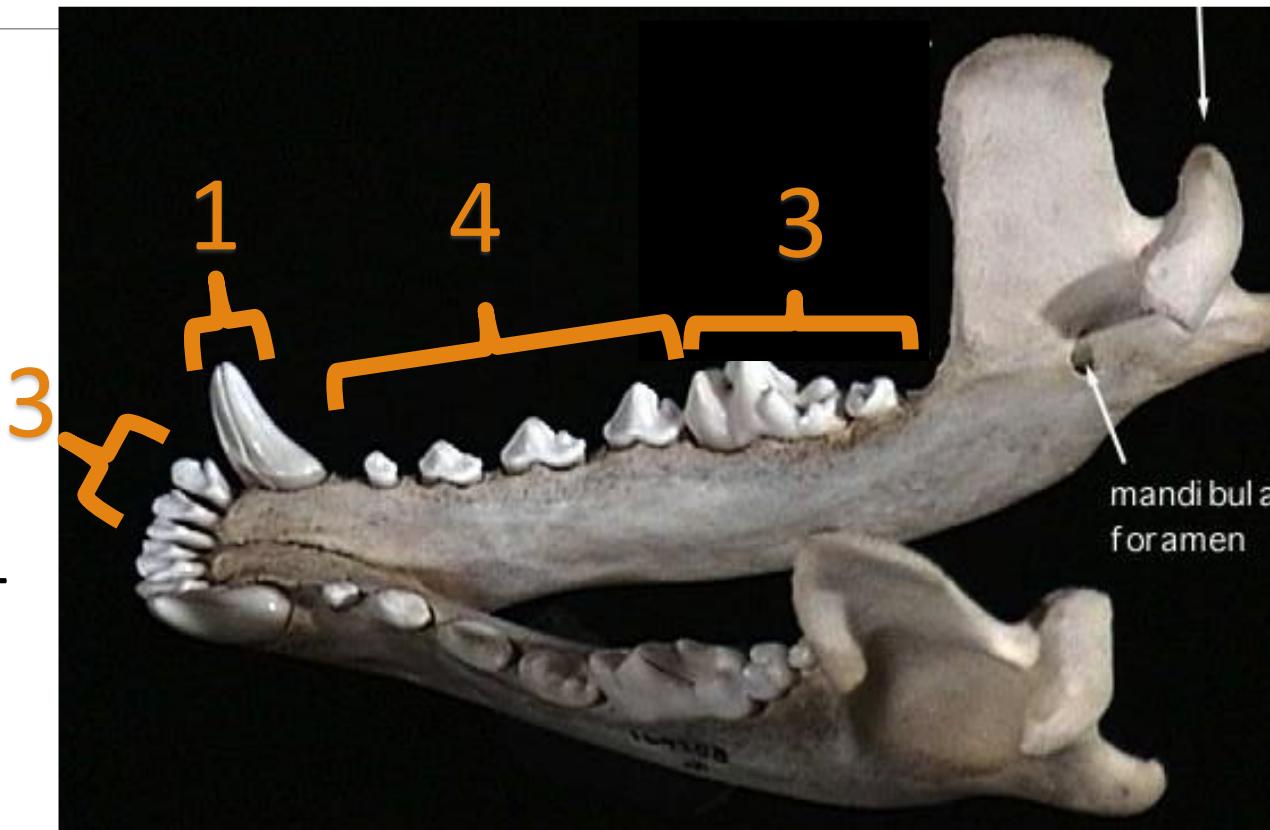
— 5 mm —



Microtus pennsylvanicus (meadow vole) skull

Dental Formulae

- On bottom:
- Incisors = 3
- Canines = 1
- Premolars = 4
- Molars = 3



Canis lupus (gray wolf) jawbone

Dental Formulae

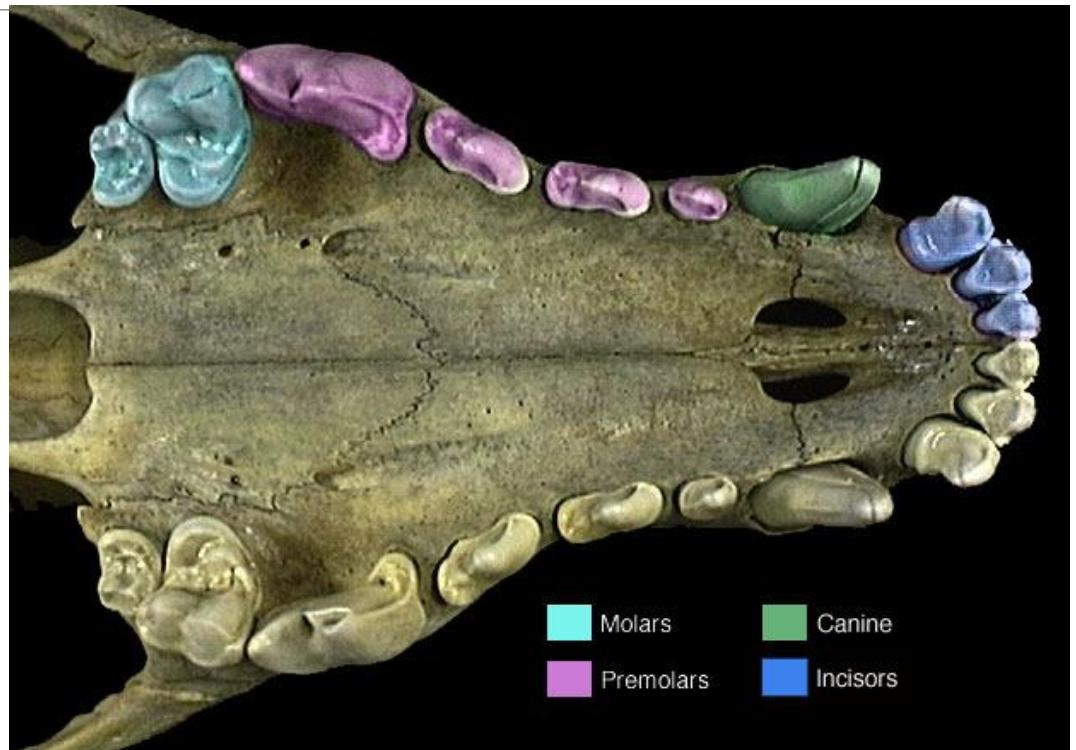
- On top:
- Incisors = ?
- Canines = ?
- Premolars = ?
- Molars = ?



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
- $(3/3 + 1/1 + 4/4 + 2/3) \times 2 = 42$

Today's Lab

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

Bones to Know:

Carpals	Ribs	Auditory bulla	Occipital Bone
Clavicle	Sacrum	Basioccipital	Occipital condyle
Femur	Scapula	External auditory meatus	Palatine
Fibula	Sternum	Foramen magnum	Parietal
Humerus	Tarsals	Frontal	Postorbital process
Ilium	Tibia	Infraorbital foramen	Premaxilla
Ischium	Ulna	Interparietal	Sagittal crest
Metacarpals	Cervical vertebrae	Jugal	Squamosal bone
Metatarsals	Thoracic vertebrae	Lacrimal	
Patella	Lumbar vertebrae	Mandible	
Phalanges	Caudal vertebrae	Mandibular fossa	
Pubis		Maxilla	
Radius		Nasal bone	

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 delineating 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

