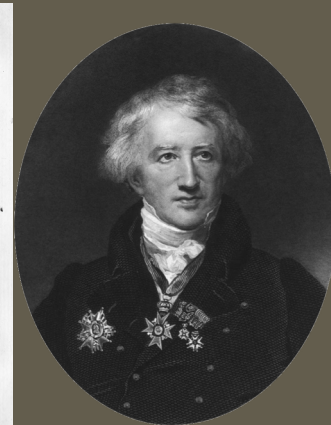
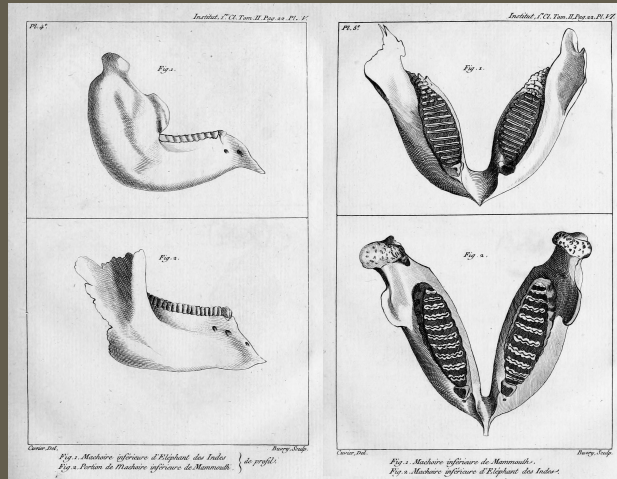
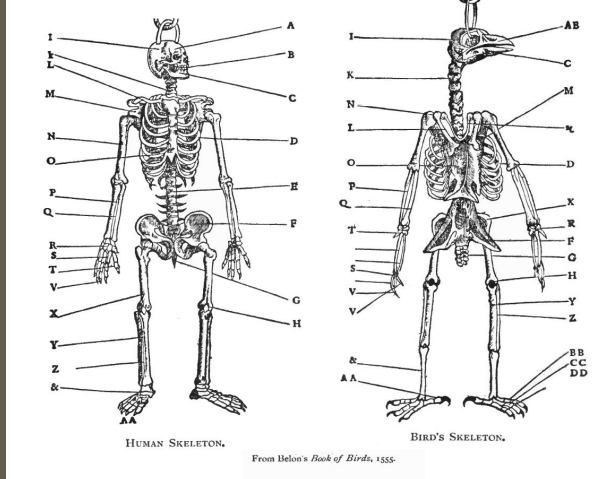




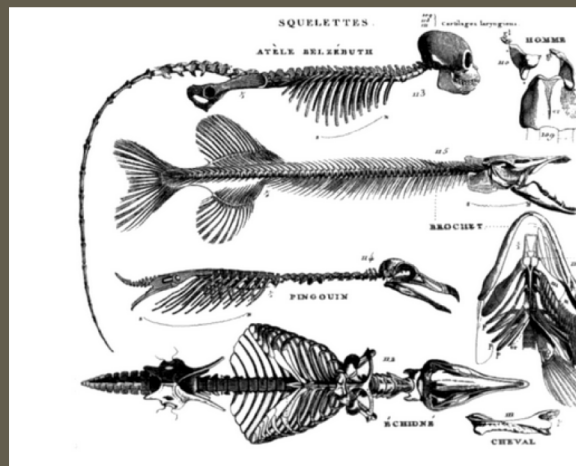
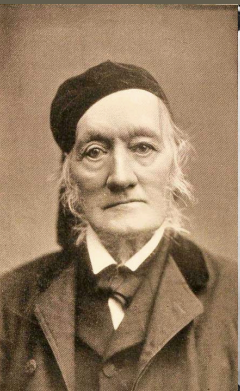
Pierre Belon (1517-1564)  
Primeira ilustração de anatomia comparada de elementos homólogos

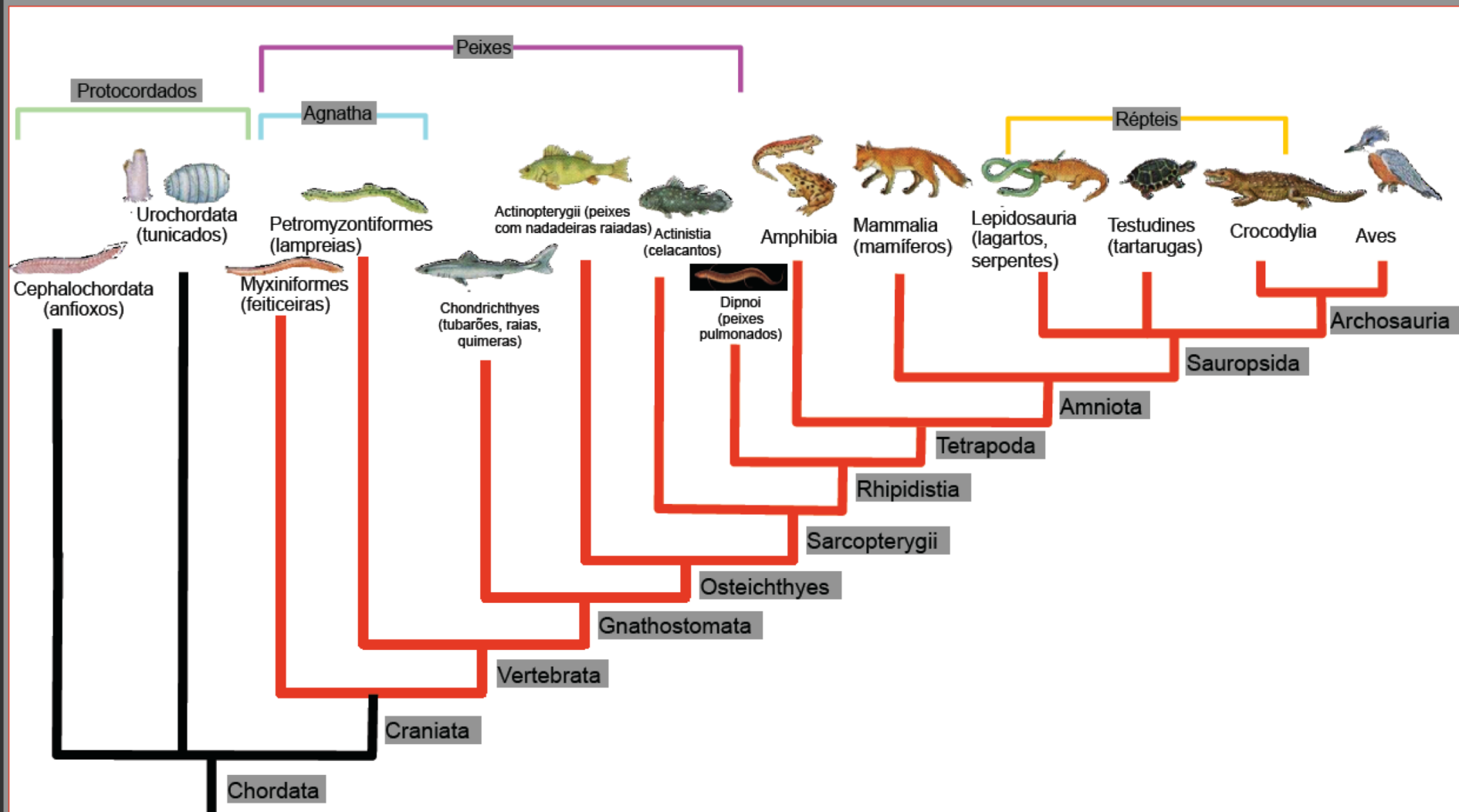
Georges Cuvier (1769-1832)  
Catastrofismo e Princípio das correlações das partes

# ESQUELETO

Richard Owen (1804-1892)  
Teoria do arquétipo  
Cunhou o termo "homologia" distinguindo-a da analogia

Étienne Geoffroy Saint-Hilaire (1772-1844)  
Princípio das conexões entre órgãos = topologia





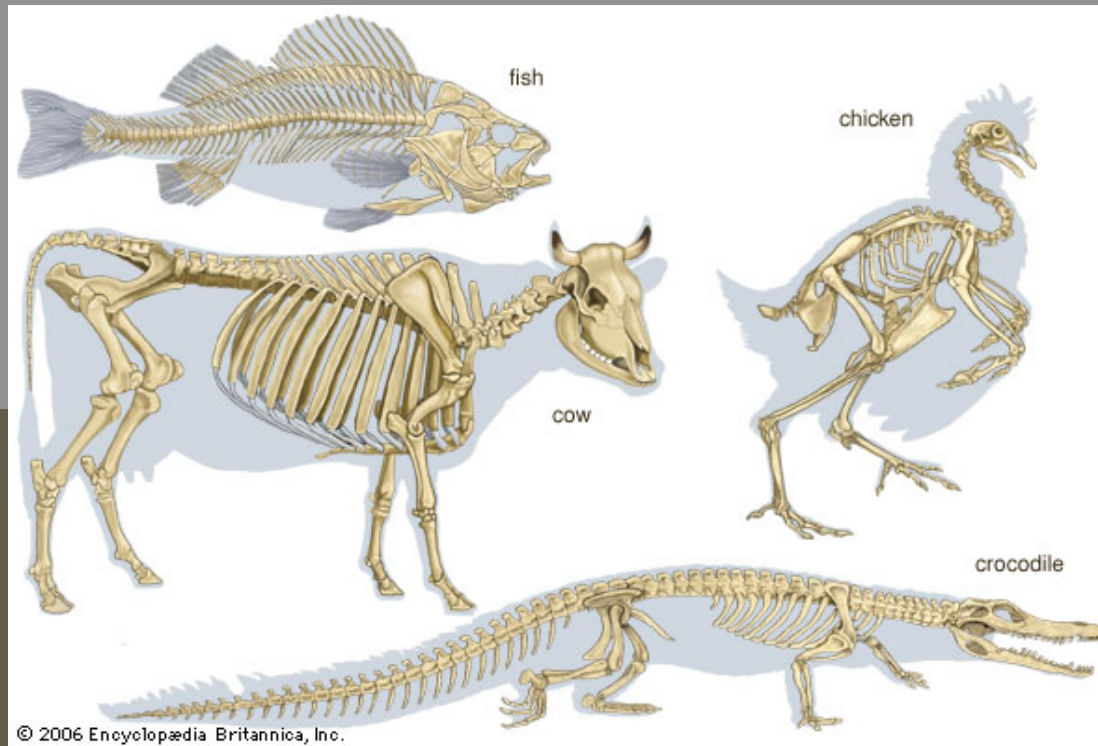


## Generalidades sobre o esqueleto

- esqueleto interno e articulado dos vertebrados: único no reino animal
- conservativo, o que permite inferências filogenéticas, pois homologias são facilmente reconhecidos no esqueleto (de um modo geral, não varia tanto a nível de espécie)
- a fossilização do esqueleto permite inferências temporais
- importante papel funcional: revela posturas, adaptações locomotoras, adaptações sensoriais (desenvolvimento relativo das diferentes partes do encéfalo), etc.
- ossos podem revelar detalhes de outros sistemas:
  - i) cicatrizes nos ossos podem indicar origem e inserção de músculos
  - ii) forames cranianos indicam arranjo de nervos cranianos, etc.

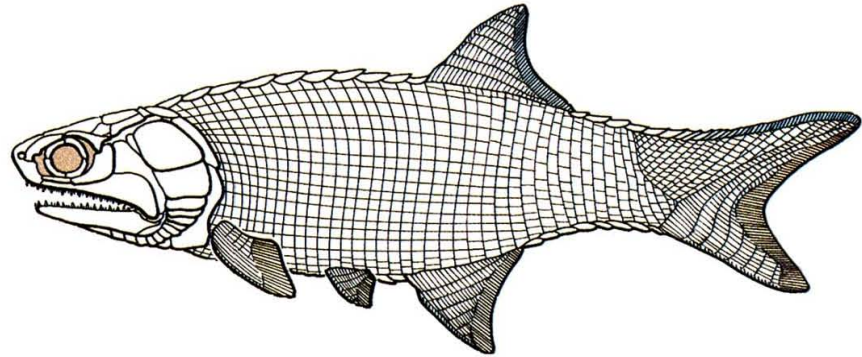
## Anatomia comparada: Esqueleto

*objetivos: realizar comparações entre os grandes grupos  
e elucidar tendências evolutivas amplas*



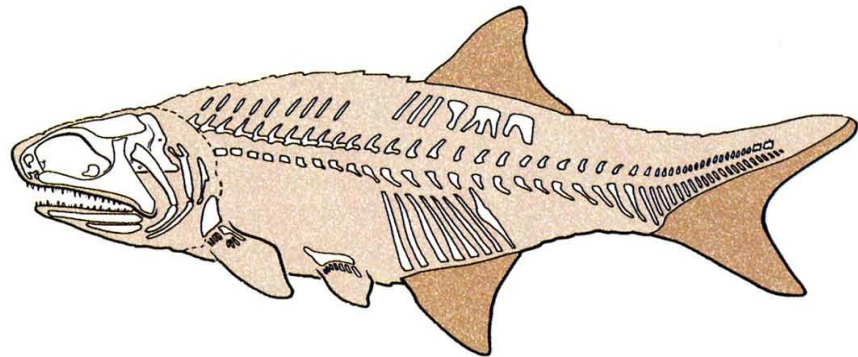
# Osteichthyes

**Esqueleto dérmico**

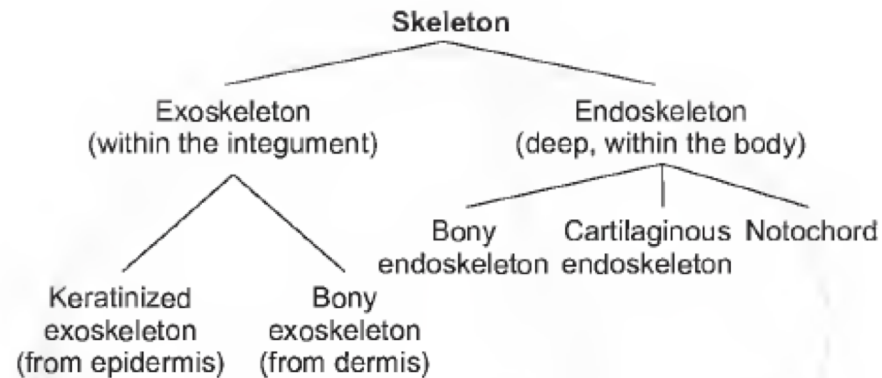


**Endoesqueleto**

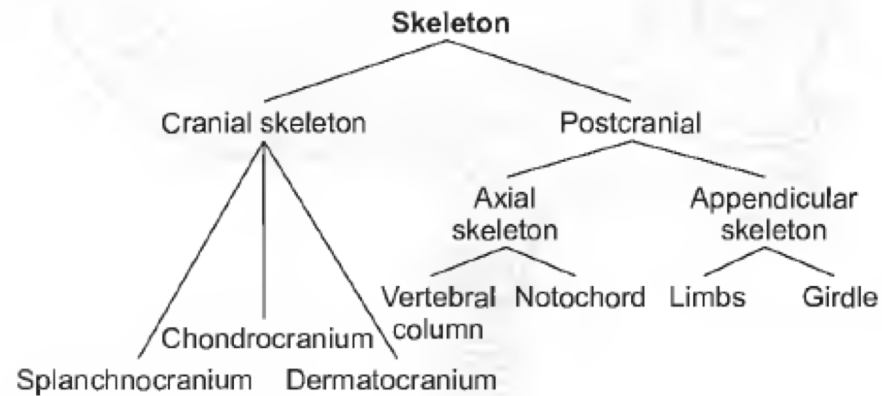
- ossificação endocondral







A)

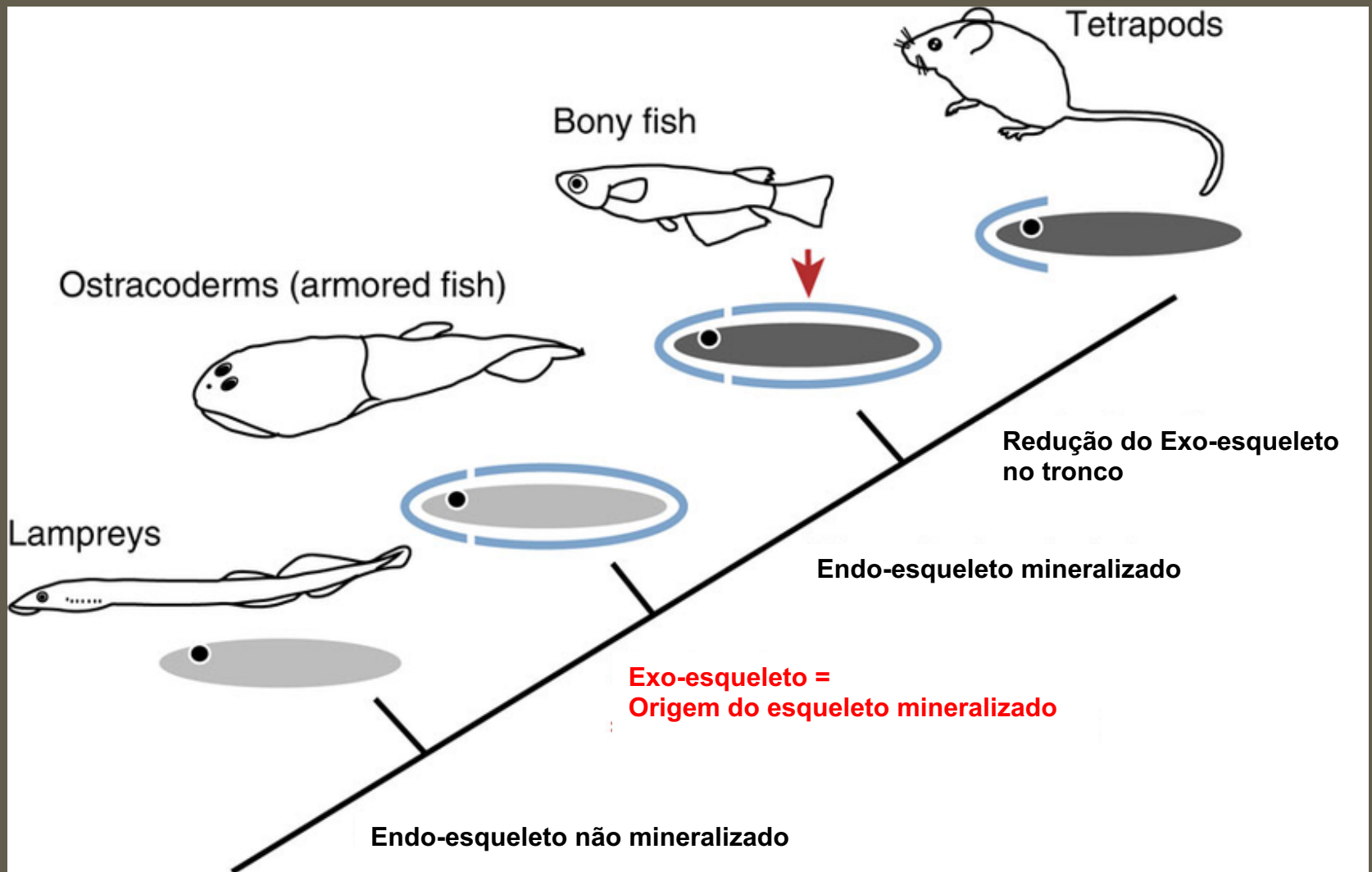


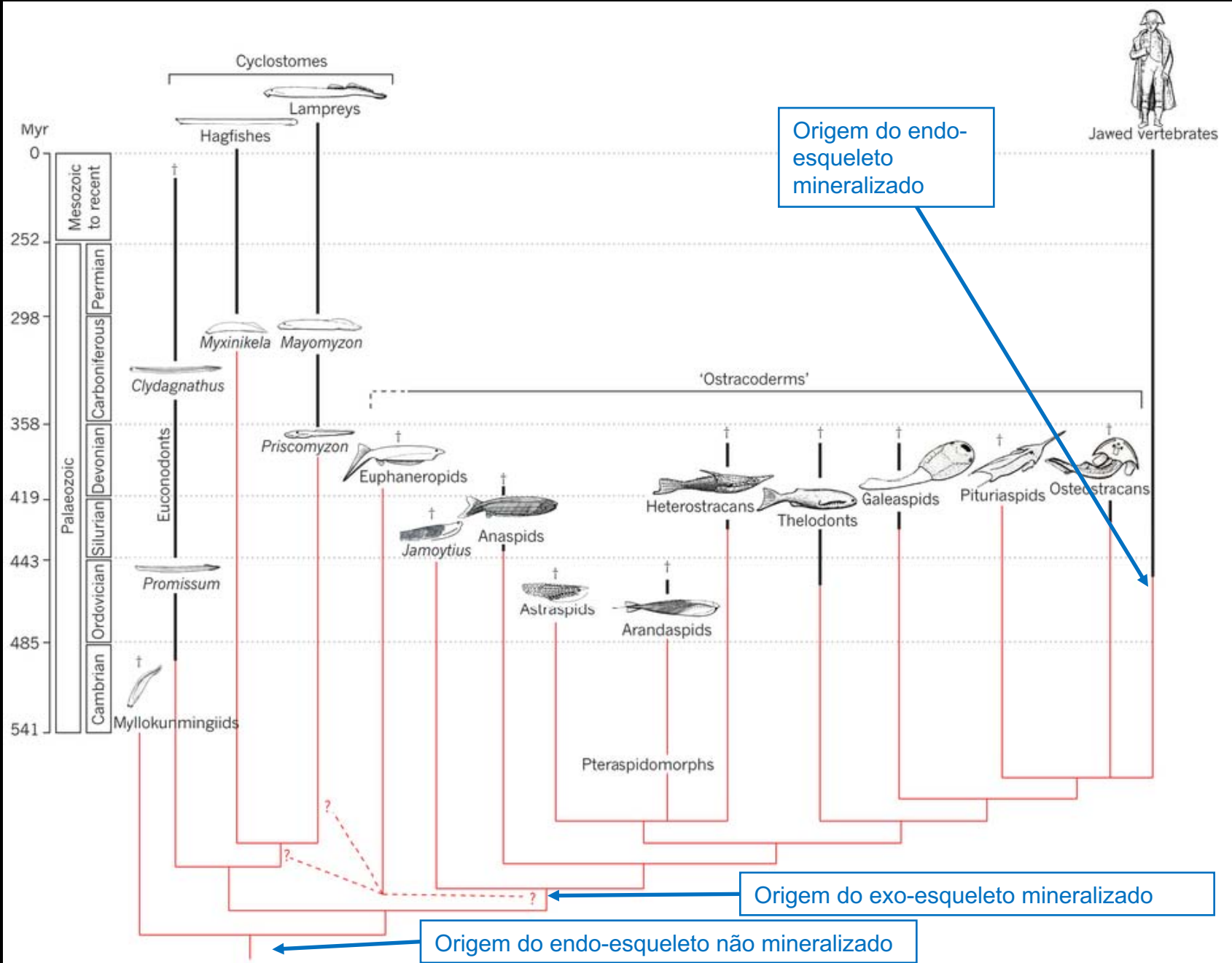
B)

## ORGANIZAÇÃO DOS TECIDOS ESQUELÉTICOS

A- como sistema de proteção e suporte com origens comuns

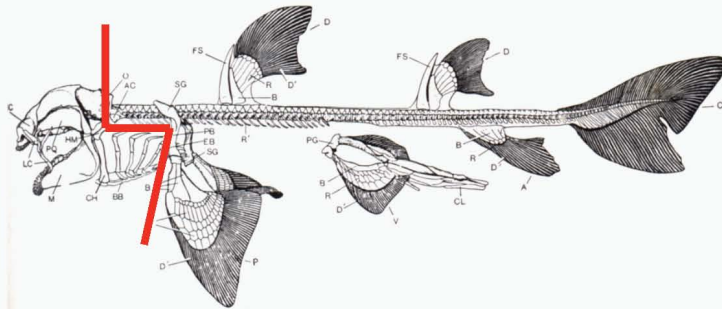
B- como conjuntos estruturais com funções associadas





# Divisão do esqueleto

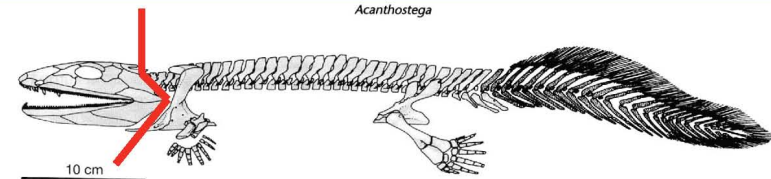
## craniano e pós-craniano



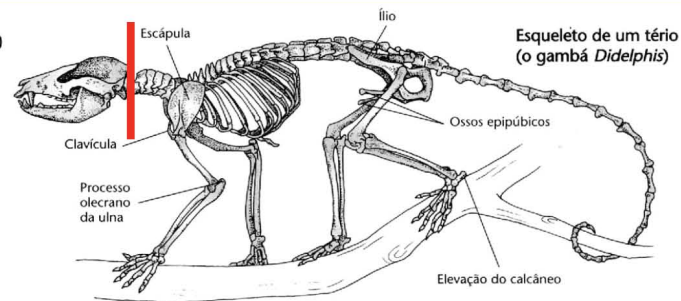
**Fig. 107.** Skeleton of a shark (Cestracion). *A*, Anal fin; *AC*, auditory capsule; *B*, basal elements of fin; *BB*, basibranchial; *C*, caudal fin; *CH*, ceratohyal; *CL*, claspers of male; *D*, dorsal fins; *D'*, dermal rays of fin; *EB*, epibranchial; *FS*, fin spines; *HM*, hyomandibular; *LC*, labial cartilages; *M*, mandible; *NC*, nasal capsule; *O*, orbit; *P*, pectoral fin; *PB*, pharyngobranchial; *PG*, pelvic girdle; *PQ*, palatoquadrate; *R*, radial elements of fin; *R'*, ribs; *SG*, pectoral girdle; *V*, pelvic (ventral) fin. (From Dean.)

craniano

pós-craniano



(b)



Esqueleto de um tório  
(o gambá *Didelphis*)



# Divisão do esqueleto

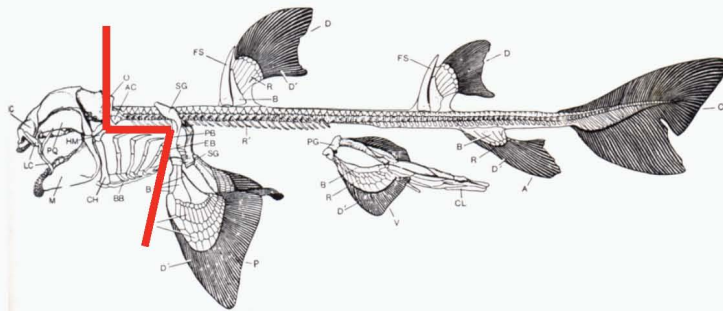
## *craniano e pós-craniano*

### Craniano

- 1) Neurocrânio
- 2) Esplancnocrânio (arcos maxilares, hióideos e branquiais)

### Pós-craniano

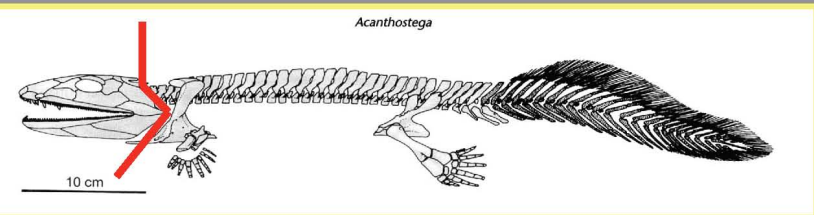
- 1) Axial (coluna, notocorda, costelas, esterno, nadadeiras ímpares)
- 2) Apendicular (cinturas e membros peitorais e pélvicos)



**Fig. 107.** Skeleton of a shark (Cestracion). A, Anal fin; AC, auditory capsule; B, basal elements of fin; BB, basibranchial; C, caudal fin; CH, ceratohyal; CL, claspers of male; D, dorsal fins; D', dermal rays of fin; EB, epibranchial; FS, fin spines; HM, hyomandibular; LC, labial cartilages; M, mandible; NC, nasal capsule; O, orbit; P, pectoral fin; PB, pharyngobranchial; PG, pelvic girdle; PQ, palatoquadrate; R, radial elements of fin; R', ribs; SG, pectoral girdle; V, pelvic (ventral) fin. (From Dean.)

craniano

pós-craniano

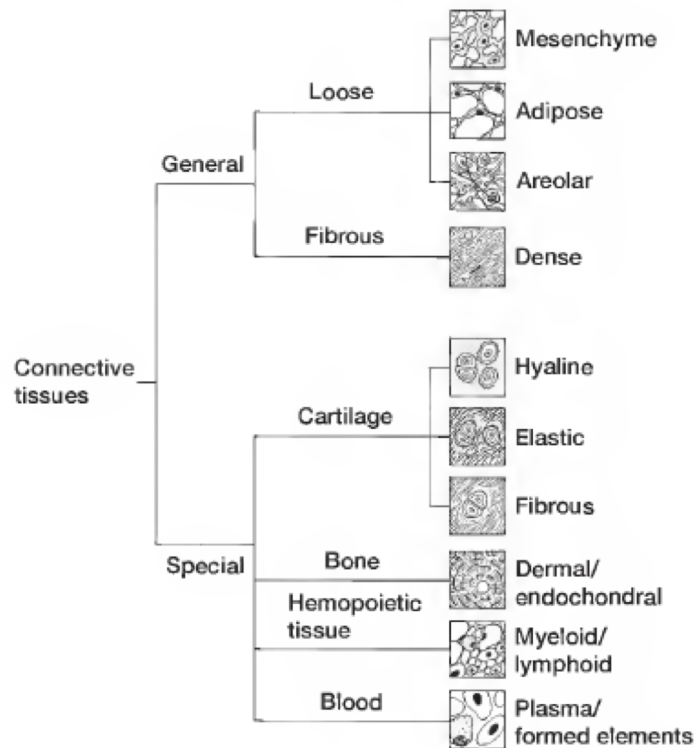


## Tecidos esqueléticos

-Cartilagem: hialina, elástica, fibrosa, calcificada

-Ossos: endocondral (de substituição), dérmico

-são exemplos de tecidos conjuntivos: aqueles em que predominam componentes extra-celulares (água, proteínas, etc.), com uma quantidade relativamente menor de células



## Tecidos esqueléticos: Cartilagem

-tipos de cartilagem variam de acordo com a composição relativa dos principais ingredientes da matriz (tipos e quantidade de colágeno, elastina, proteínas de preenchimento)

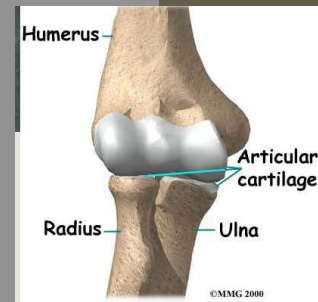
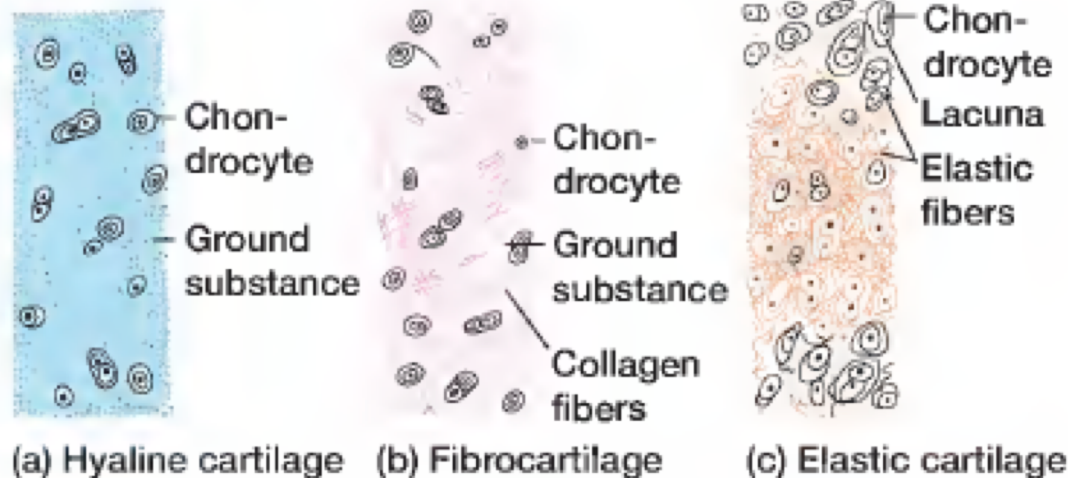
### Tecido não vascularizado

-hialina: mais comum, transparente; ocorre nas pontas dos ossos longos, parte ventral do esterno, laringe e traquéia.

-elástica: rede de fibras de elastina mais densa que na hialina; orelha, epiglote.

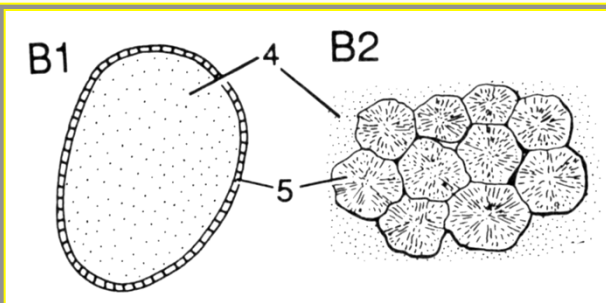
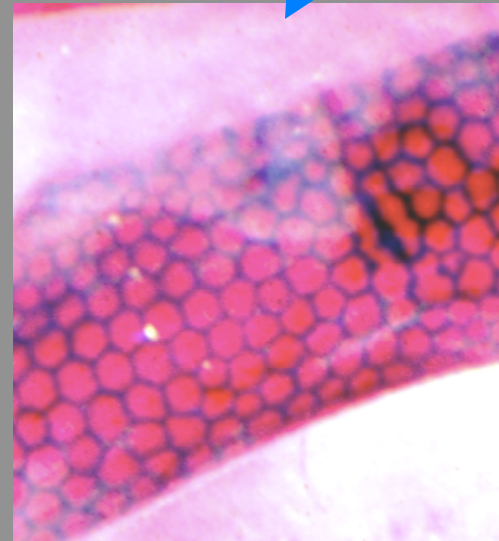
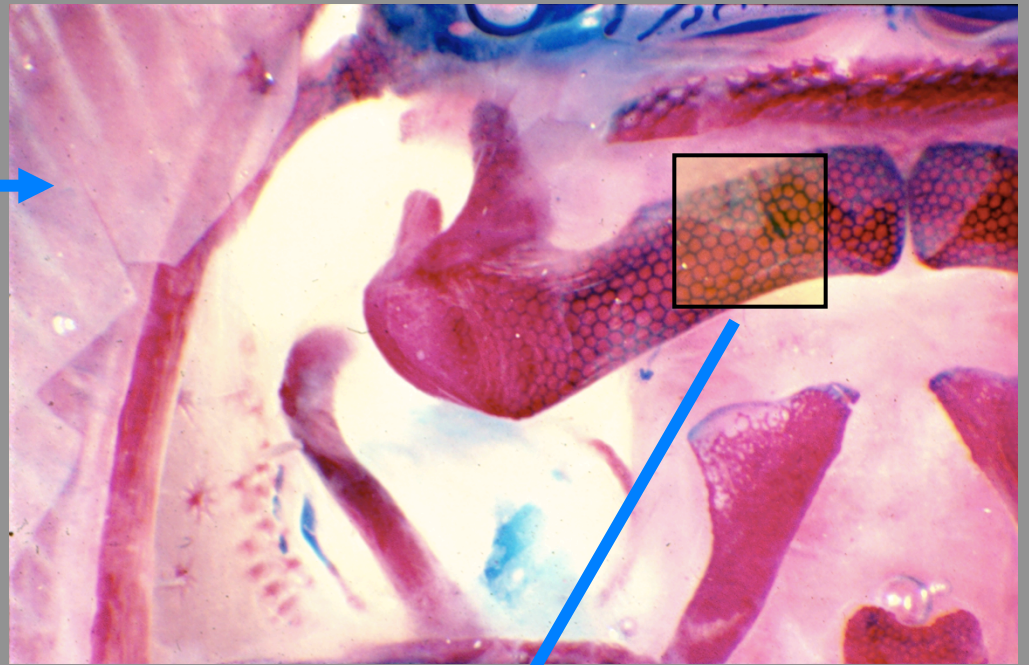
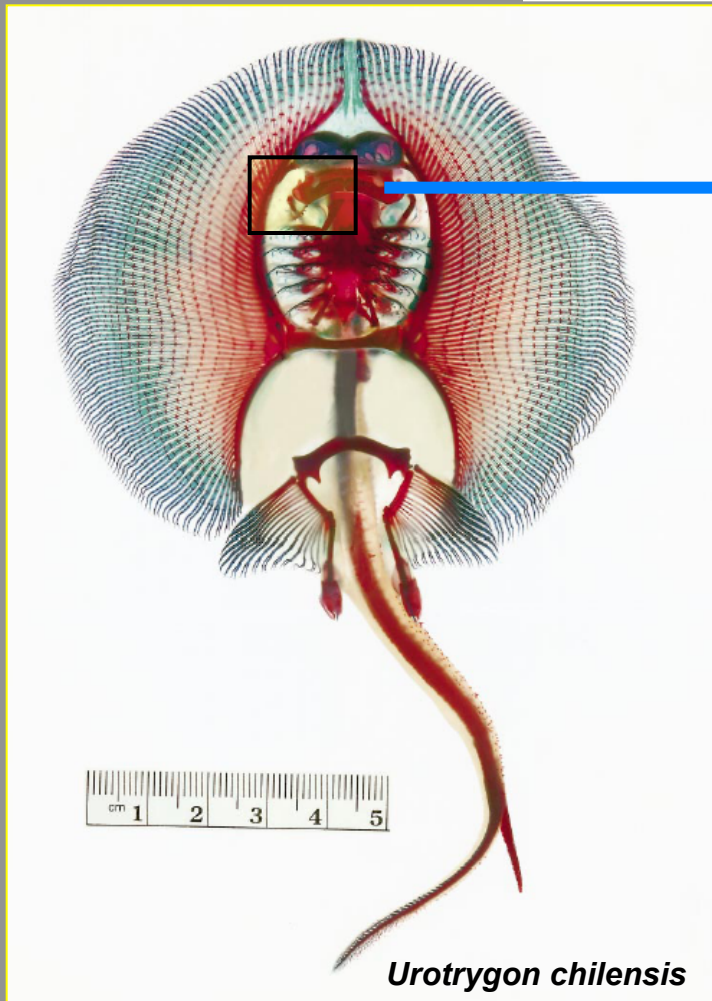
-fibrosa: muitas fibras de colágeno, quase um tendão; discos intervertebrais cintura pélvica.

-calcificada: deposição superficial de hidroxapatita; Chondrichthyes



matriz: fibras de colágeno, fibras de elastina e substância de preenchimento (proteínas)

# Cartilagem calcificada



## Tecidos esqueléticos: Osso

-tipos:

Tecido vascularizado

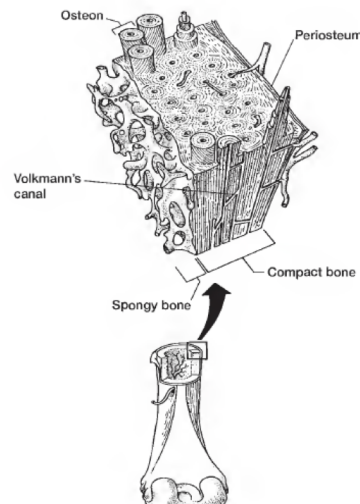
ossos podem se formar diretamente em tecido conjuntivo superficial (1) ou dentro e entorno de cartilagem (2):

1) osso dérmico

2) osso endocondral (de substituição)

-diferem principalmente quanto ao posicionamento no corpo quando se formam, e se são pré-formados em cartilagem;

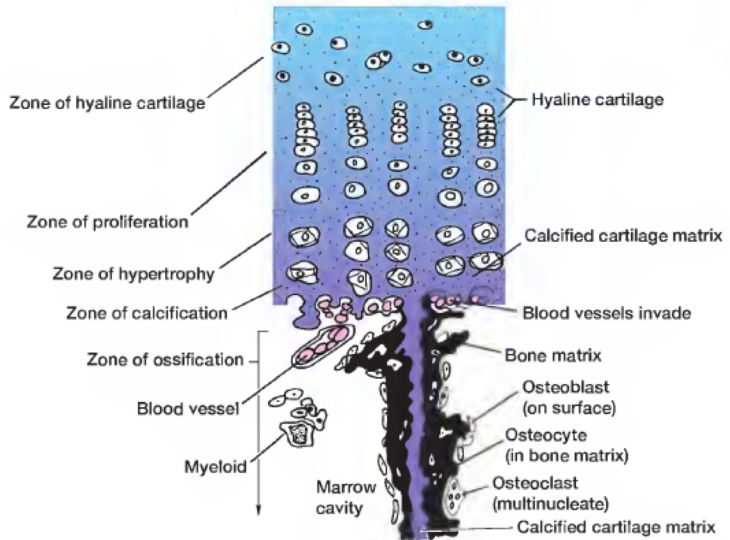
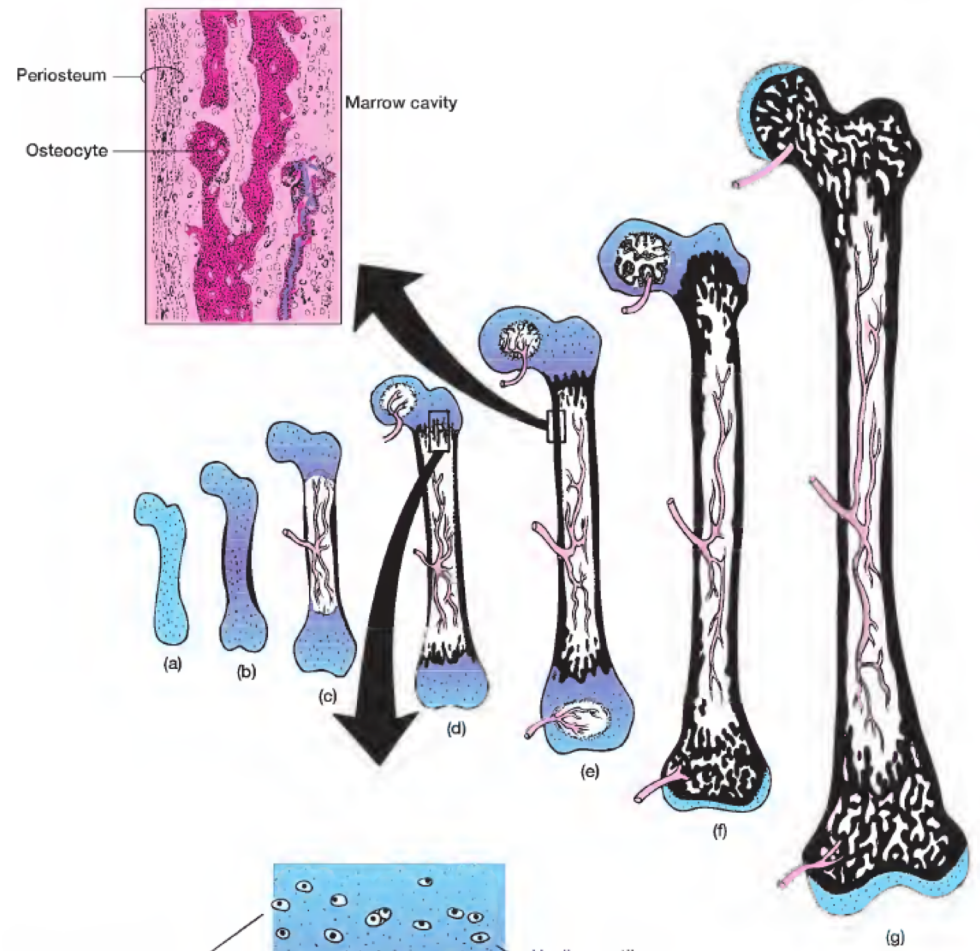
-histologicamente muito semelhantes; nos adultos, uma vez formados, são indistinguíveis.





# PASSOS NO CRESCIMENTO DE OSSO LONGO ENDOCONDRALE E SUBSTITUIÇÃO DO PRIMÓRDIO CARTILAGINOSO

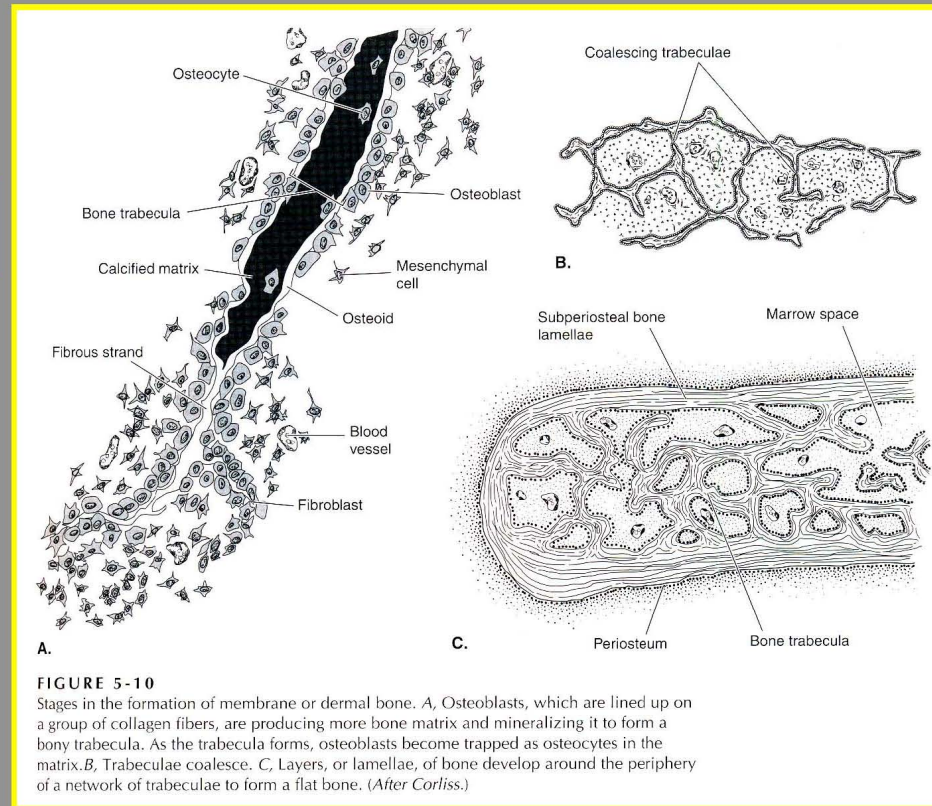
- a) Cartilagem hialina
- b) Colar osseo aparece (osso pericondral), cartilagem profunda é absorvida
- c) Calcificação da cartilagem na diáfise seguida por invasão de vasos sanguíneos
- d) Detalhe da area de ossificação na (metáfise)
- e,f) Aparecem novos centros de ossificação nas epífises
- g) Cartilagem se reduz à região de contato entre ossos, formando superfície de articulação



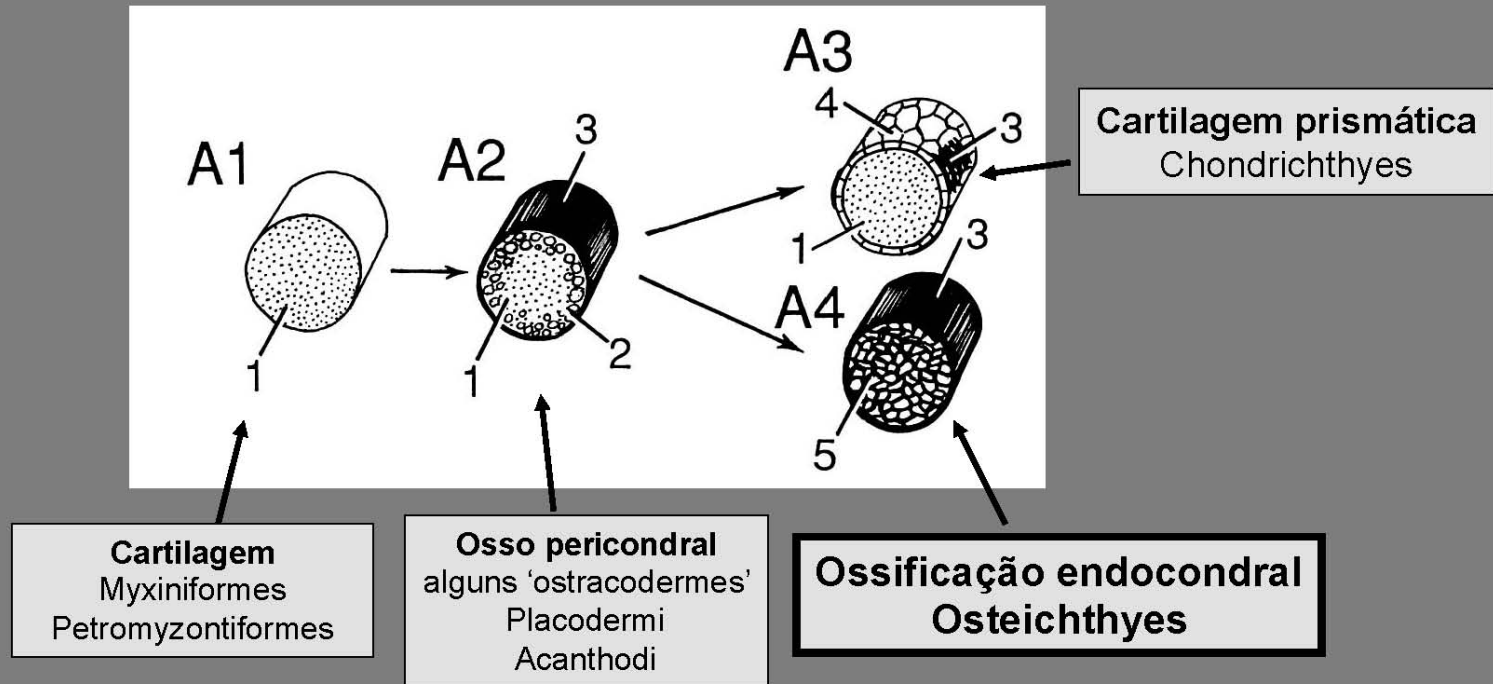
## Tecidos esqueléticos: Osso dérmico

células de mesênquima → osteoblastos → deposição de matriz extra-celular (osteóide)  
→ calcificação do osteóide: trabéculas → trabéculas coalescem formando 'emaranhados'  
→ deposição de hidroxiapatita contínua nos emaranhados formando osso

não passa por estágio cartilaginoso



## Tipos de esqueleto



# O CRÂNIO

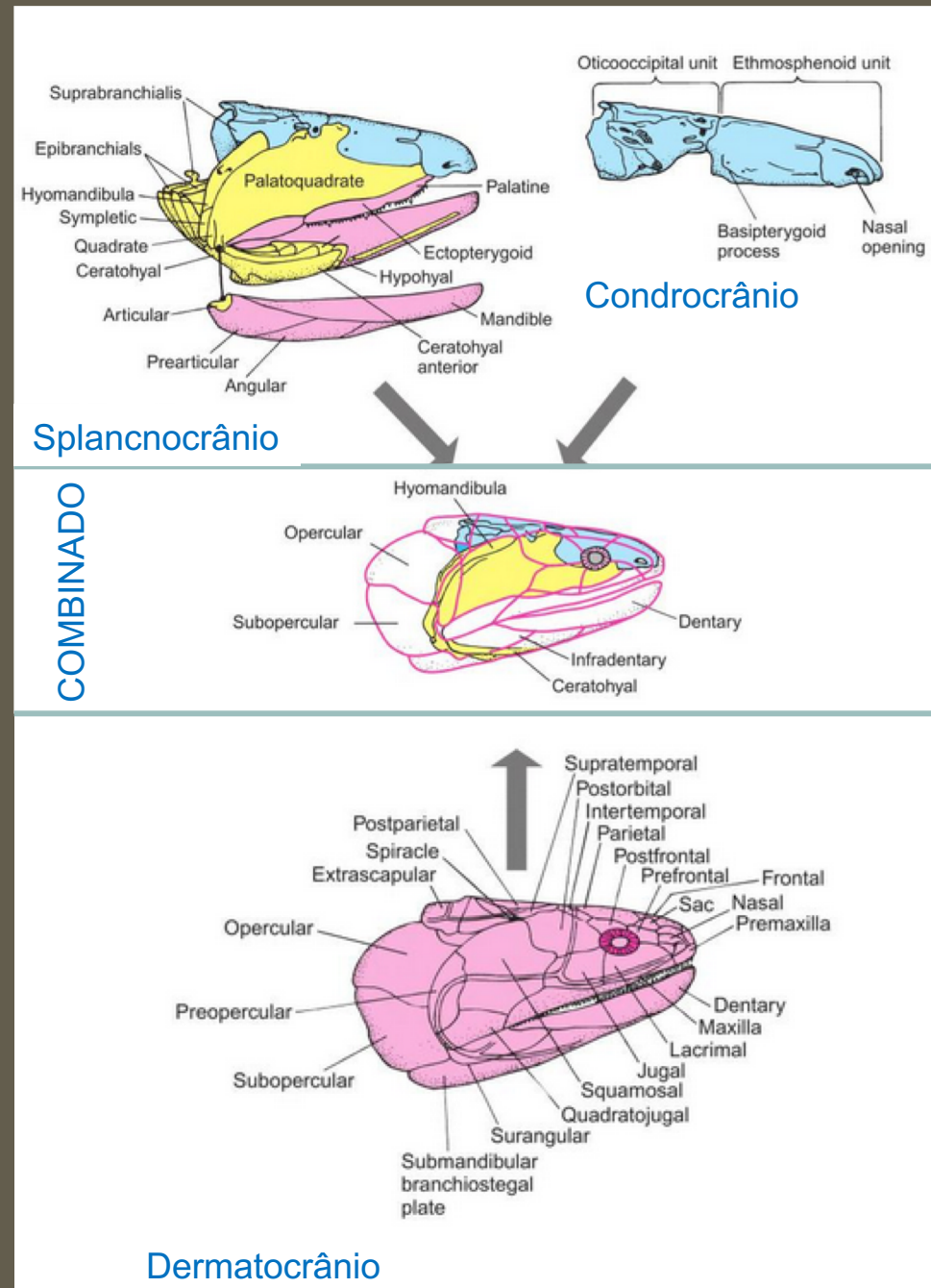
Composto por 3 partes distintas com origens filogenéticas separadas

1- **esplancnocrânio** mais antigo = sustenta as fendas faríngeais nos protocordados, formado por cartilagem

2- **condrocrânio** = sustenta e empareda o cérebro, formado por cartilagem ou osso endocondral

3- **dermatocrânio** = forma a caixa craniana mais externa, formado por ossos dérmicos

**Neurocrânio** = se refere ao **condrocrânio** e às **cápsulas sensoriais** adjacentes (capsulas nasais, ópticas e óticas)

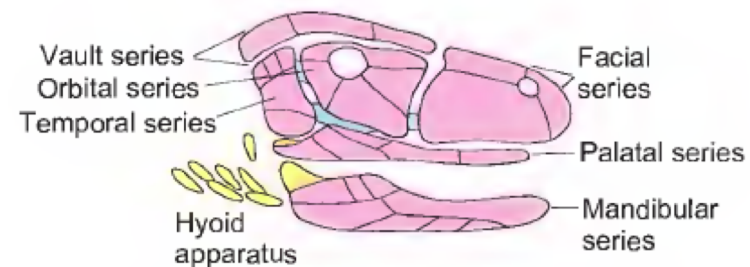
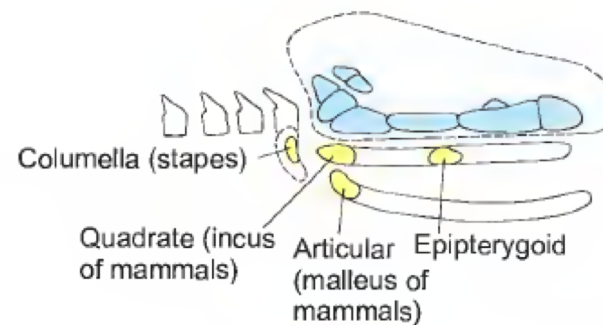
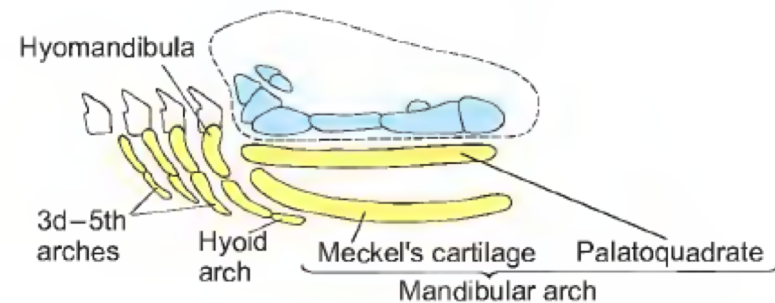
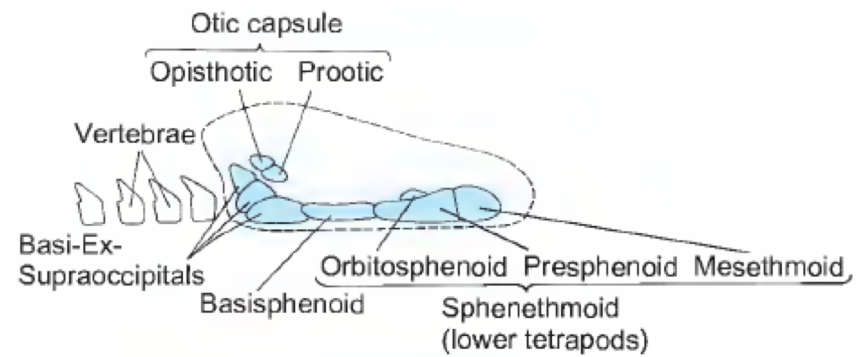


# CONTRIBUIÇÕES

Condrocrânio

Esplancnocrânio

Dermatocrânio

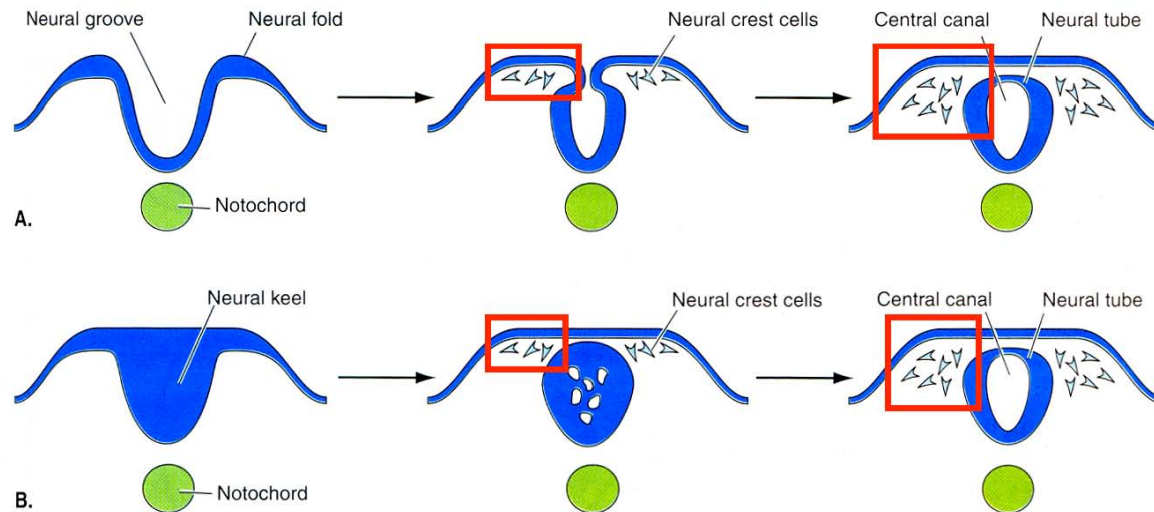




# CONDROCRÂNIO ou NEUROCRÂNIO

neurulação

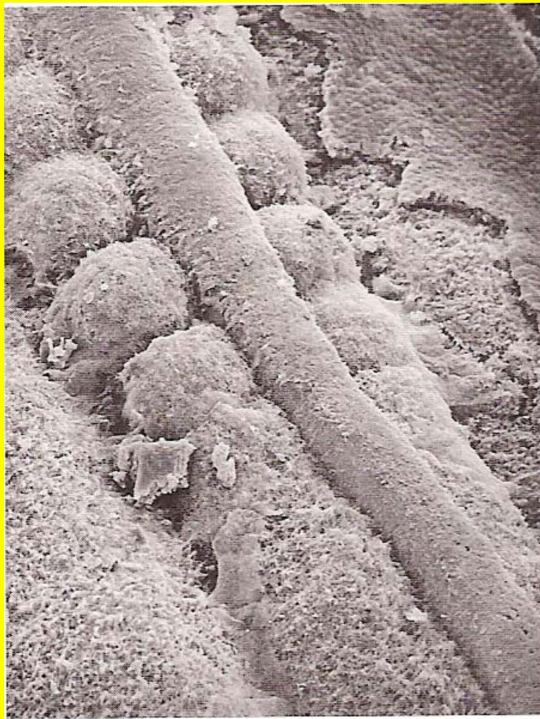
-formação do neurocrânio: a partir de células provenientes da crista neural: ectomesênquima



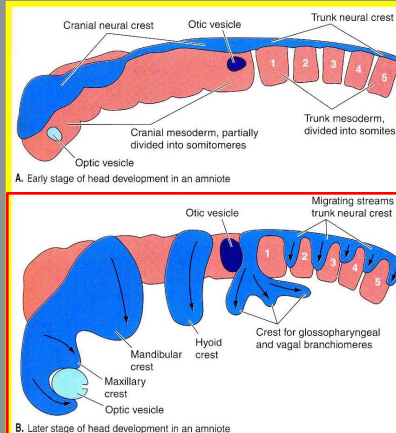
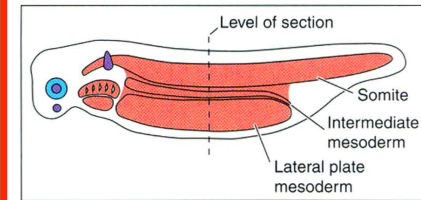
**FIGURE 4-19**

Formation of neural tube in the trunk via neural folds or cavitation. *A*, Neural folds meet and fuse in the midline, pinching off the hollow neural tube. *B*, A solid neural keel forms; cavities form within it and fuse to form the hollow neural tube. The scheme shown in *A* occurs in sharks, basal osteichthyan fishes, and tetrapods. The scheme shown in *B* occurs in lampreys and teleosts as well as in portions of the neural tube in some other groups.

# Neurocrânio

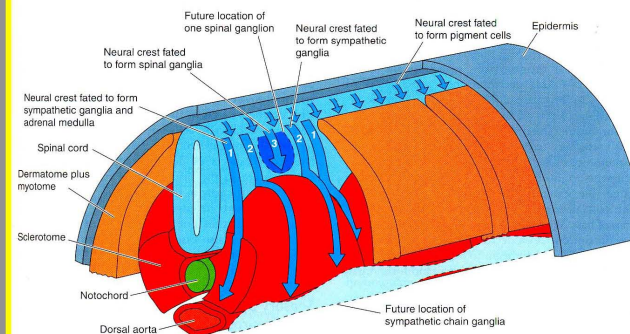


**Figure 9.3**  
Neural tube and somites. Scanning electron micrograph showing well-formed somites and paraxial mesoderm (bottom right) that has not yet separated into distinct somites. A rounding of the paraxial mesoderm into a somitomere can be seen at the lower left, and neural crest cells can be seen migrating ventrally from the roof of the neural tube. (Courtesy of K. W. Tosney.)



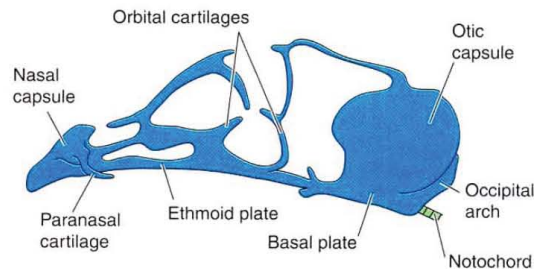
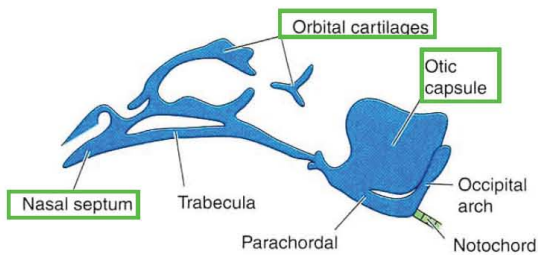
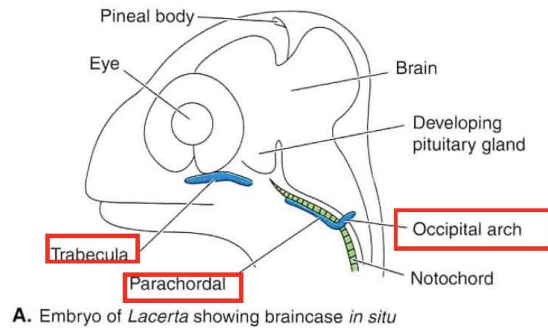
**FIGURE 4-24**  
Neural crest migration in the head of a generalized amniote (chick, *Gallus*) as seen in lateral view. A, An early stage of head development, in which the cranial neural crest (ectomesenchyme) still is located dorsally. B, A later stage of head development, when neural crest cells are migrating actively around the eye and down into the maxillary and mandibular branchiomeres. The stream of hyoid crest migrates anterior to the ear; glossopharyngeal and vagal crest migrates posterior to the ear. The relationships between the streams of neural crest cells and the mesodermal somitomeres in the head region and the somites in the body also are indicated. (Based on Noden.)

Cranio se forma  
atraves da  
Crista neural



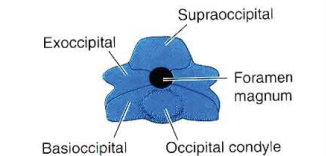
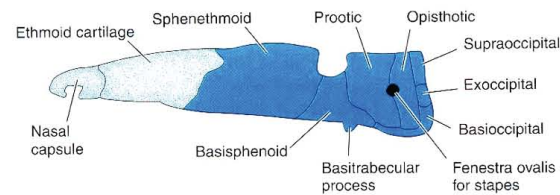
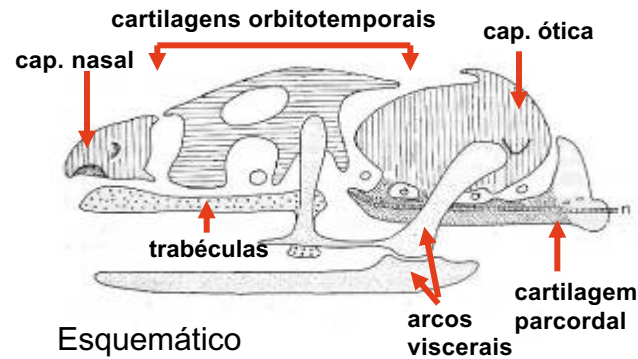
**FIGURE 4-25**  
Routes of migration of neural crest cells in the trunk of amniotes. This stereodiagram shows an idealized view of the routes of neural crest cells relative to the somites. In relation to a single somite, neural crest cells fated to form portions of the peripheral nervous system follow one of three paths. Path 1 carries the cells deep between adjacent somites or through the rostral half of each somite to form sympathetic chain ganglia or the adrenal medulla. Cells following Path 2 migrate between the sclerotome and overlying dermatome and will form portions of the sympathetic chain ganglia. Cells following Path 3 will form spinal (dorsal root) ganglia and sensory nerves for the skin and other somatic structures of the trunk. Pigment cells (short arrows) migrate out along the entire length of the neural tube. (Based on Le Douarin.)

## Neurocrânio



**FIGURE 7-1**

Lateral view of three stages in the embryonic development of the chondrocranium of a lizard. (After DeBeer.)



**FIGURE 7-2**

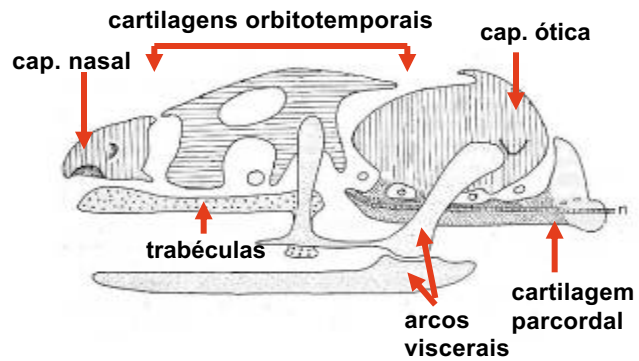
Structure of the adult chondrocranium based on that of an early tetrapod, †*Palaeoherpeton*. A, Lateral view. B, Posterior view. (Modified after Romer and Parsons.)

## ossificação do neurocrânio

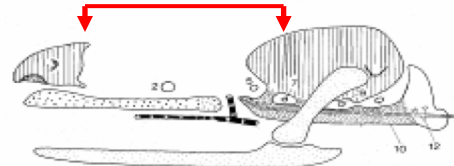
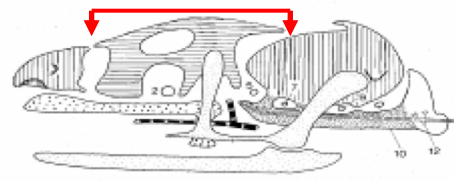
## Formação do neurocrânio em um lagarto



## PERDA DAS CARTILAGENS ORBITOTEMPORAIS

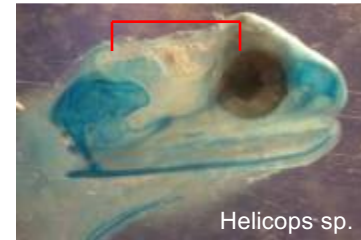


“lagartos”



“lagartos” ápodos

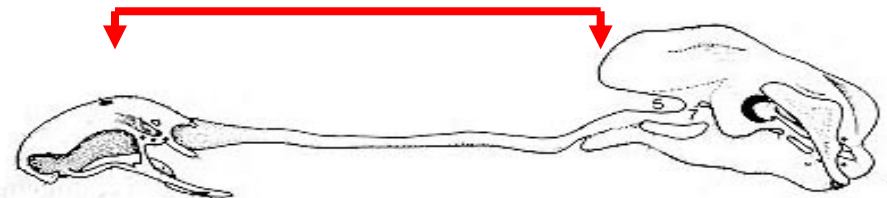
serpentes



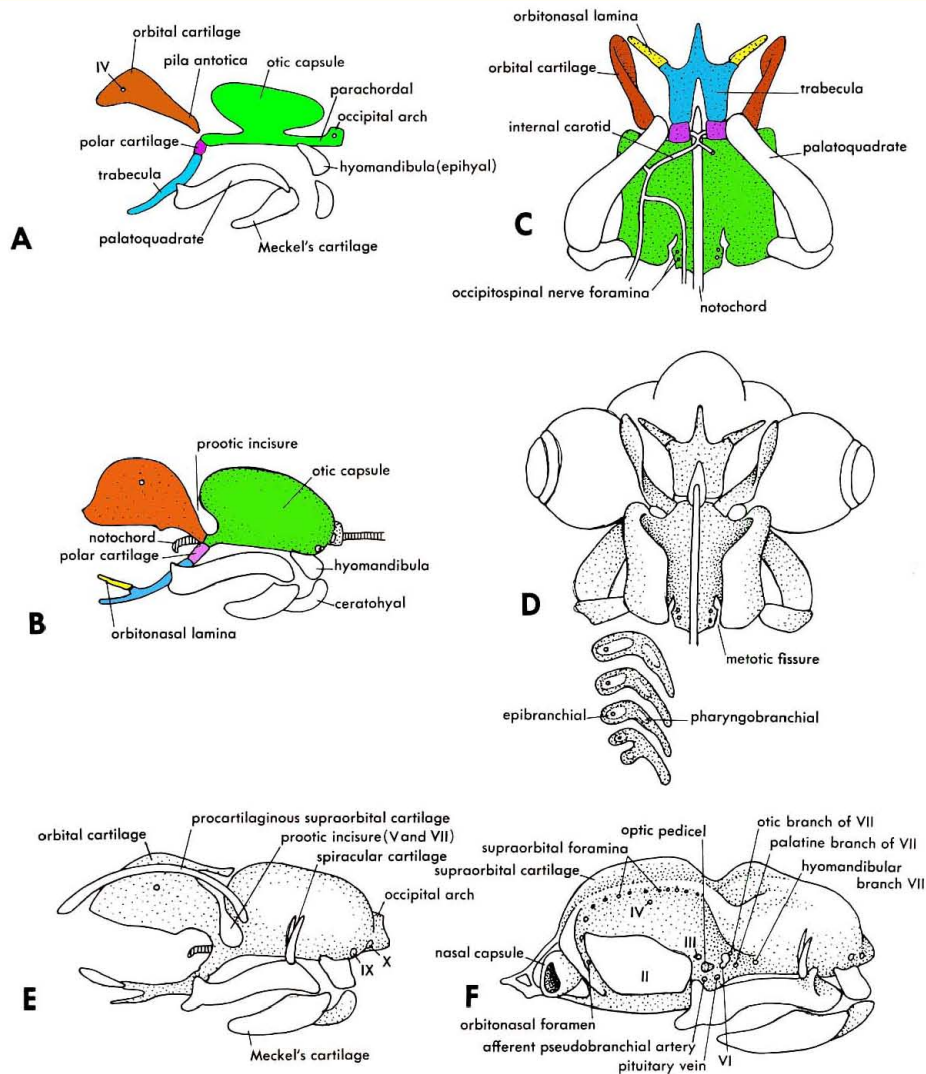
Região orbitotemporal de *Acontias meleagris* (Scincidae)



Região orbitotemporal de *Psammophis sibilans* (Colubridae)

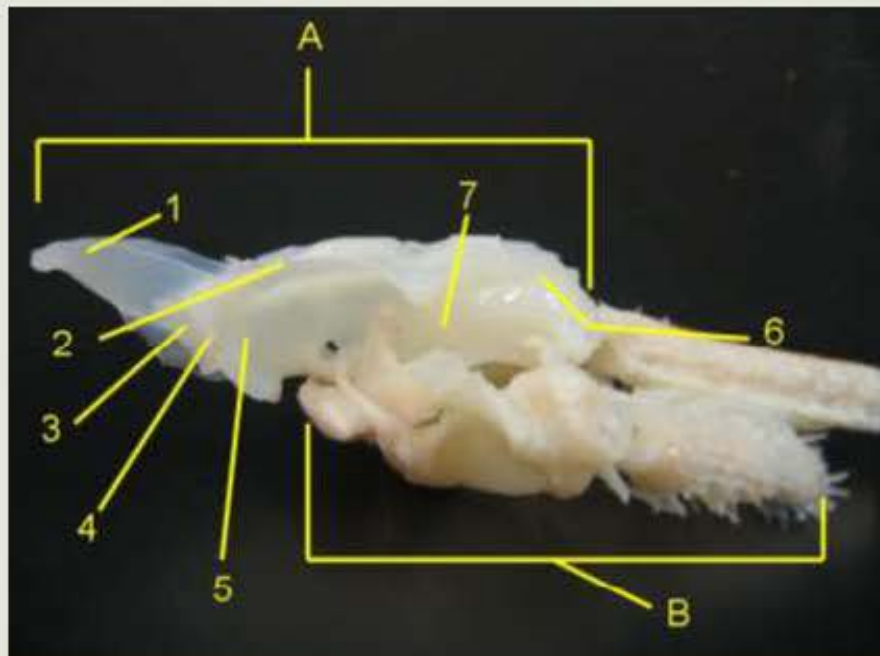


*ontogenia do neurocrânio  
de tubarão*



**Figure 5-17.** Development of head skeleton of *Squalus*. A, lateral view of 37-mm embryo; B, C, D, ventral, lateral, and dorsal views of 39-mm embryo; E, lateral view of 45-mm embryo; F, lateral view of 64-mm embryo. (After El-Toubi, 1949)



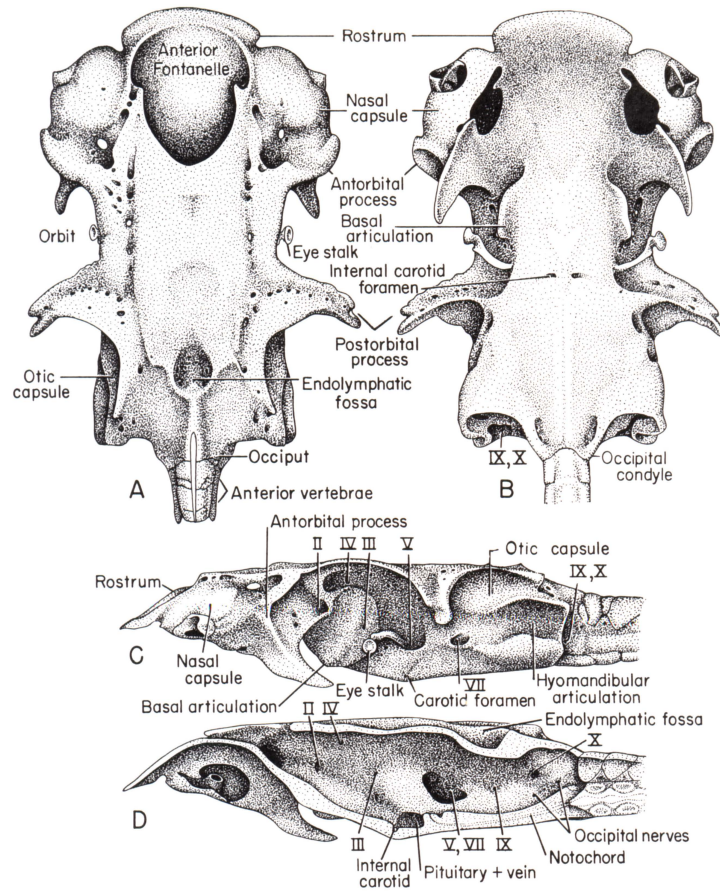


1. Meckel's Cartilage
2. Palatoquadrate
3. Rostrum
4. Labial Cartilage
5. Basihyal Cartilage
6. Ceratohyal Cartilage
7. Hyomandibular Cartilage
8. Ceratobranchial Cartilage
9. Basibranchial Cartilage
10. Hypobranchial Cartilage
11. A. Mandibular Arch
12. B. Hyoid Arch
13. C. Branchial Arch

Figure 2. Articulated chondrocranium and splanchnocranium

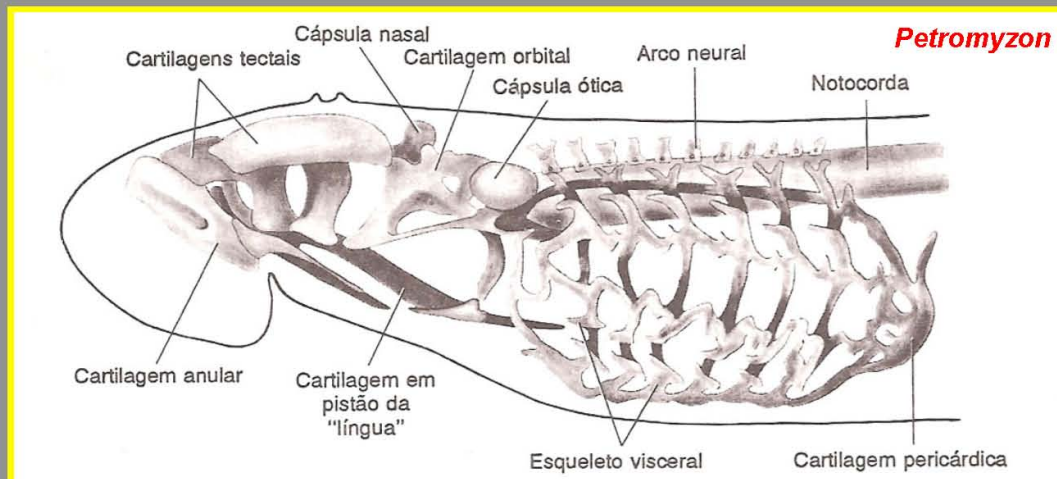
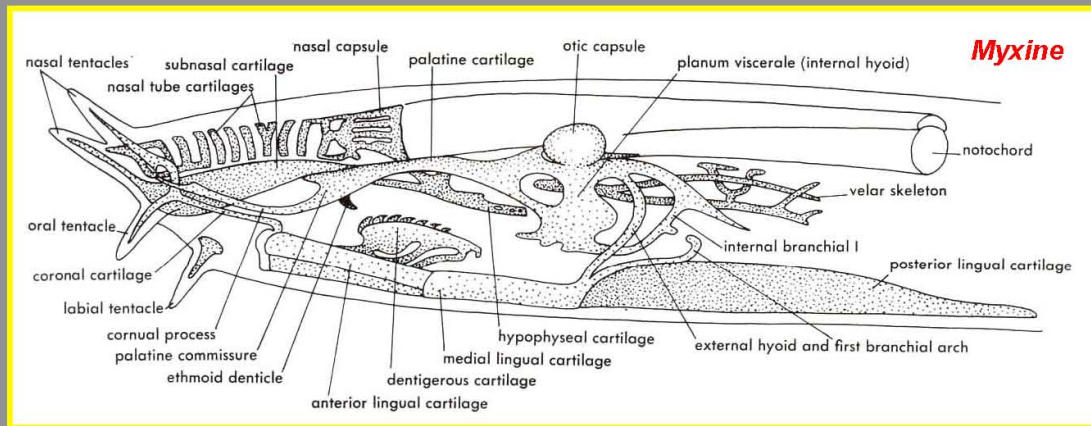
# Neurocrânio

tubarão adulto



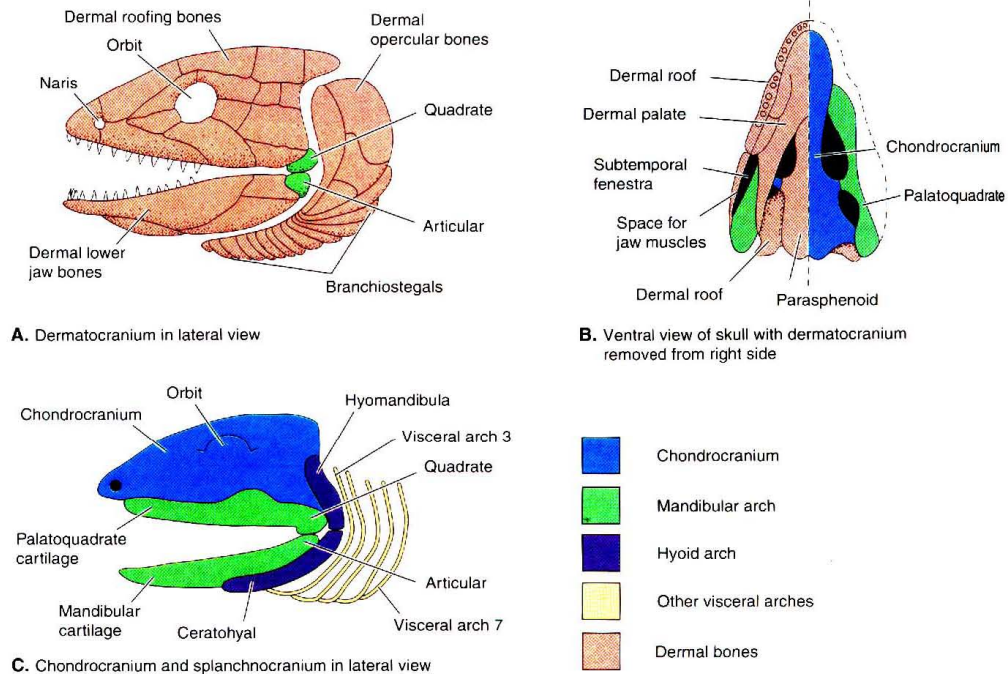
**Fig. 116.** The braincase of the shark *Chlamydoselache*; A, dorsal, B, ventral and C, lateral views, and D, sagittal section. Nerve exits in Roman numerals. (After Allis.)

# Neurocrânio



**FIGURA 8-7** ESQUELETO CEFÁLICO DE UM CICLOSTOMADO representado pelo da lampreia, *Petromyzon*, em vista lateral esquerda.

# ESPLANCNOCRÂNIO

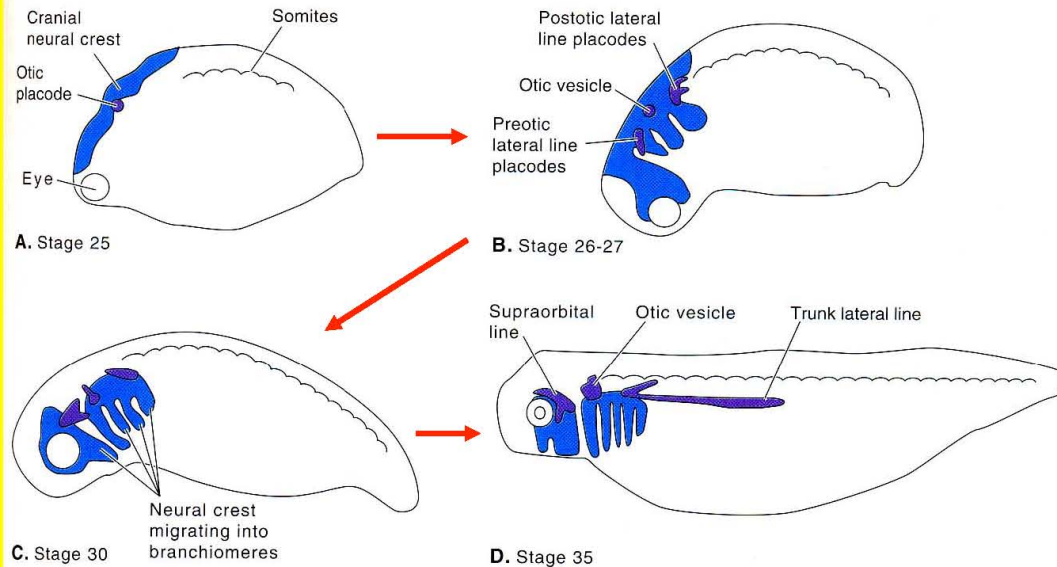


**FIGURE 7-4**

Diagrams of the components of the cranial skeleton of a generalized early bony fish, loosely based on *Amia*. *A*, A lateral view to show the dermatocranial bones that cover most of the other components. *B*, A ventral view of the skull with dermatocranial bones removed from the right side of the drawing to expose other components. *C*, A lateral view after the removal of the dermatocranium, leaving the chondrocranium and splanchnocranium.

# Origem dos componentes do Esplancnocrânio

-migração ventral de células da crista neural



**FIGURE 4-29**

Simplified diagrams of neural crest and neurogenic placodes in lateral views of salamander embryos and larvae (*Ambystoma*) at different stages of development. The preotic lateral line placodes (indicated on the figure as a group to facilitate presentation at this scale) are anterodorsal lateral line placode, anteroventral lateral line placode, and otic lateral line placode (Table 4-3). The postotic lateral line placodes (indicated on the figure as a group to facilitate presentation at this scale) are the middle lateral line placode, supratemporal lateral line placode, and trunk lateral line placode (Table 4-3). The profundal and epibranchial placodes are not indicated. A, Stage 25. B, Stage 26–27. C, Stage 30. D, Stage 35. (Redrawn and modified from Stone; for more detailed descriptions of the neural crest and neurogenic placodes of *Ambystoma*, see Northcutt and Brändle, 1995.)



# Divisão do esqueleto craniano

## neurocrânio e esplancnocrânio

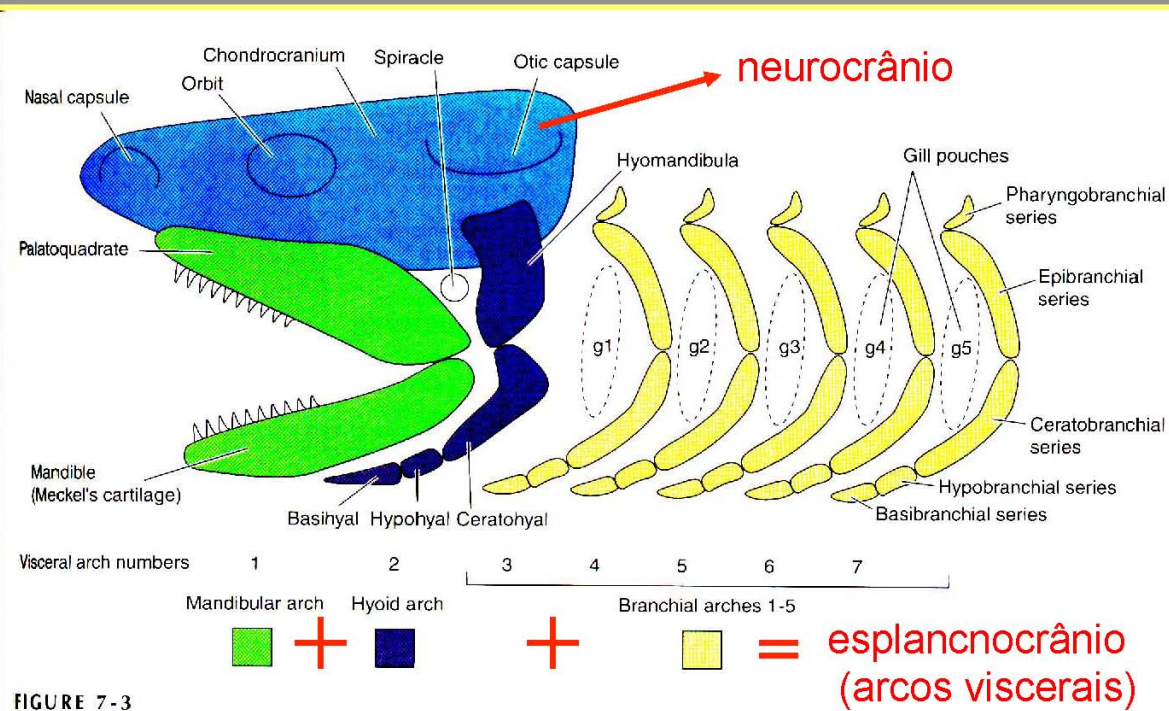
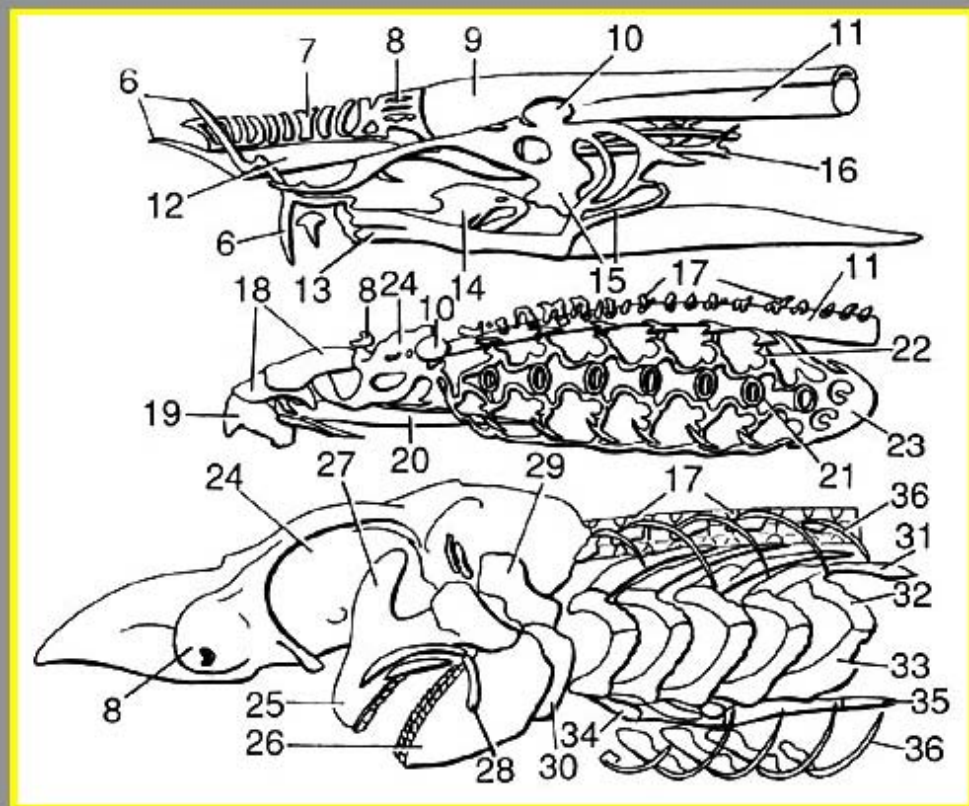
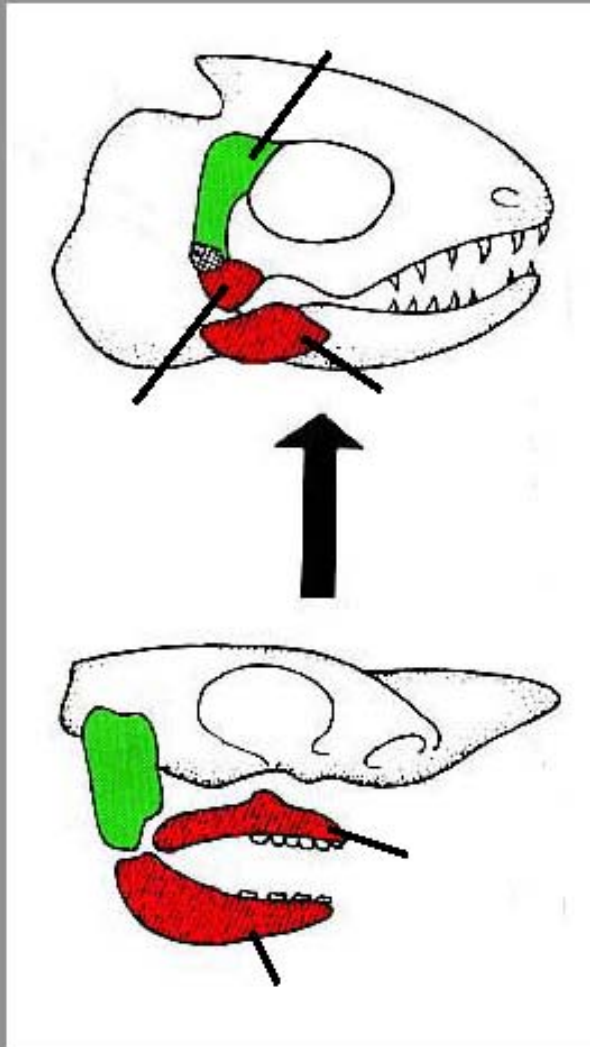


FIGURE 7-3

Lateral view of the structure of the splanchnocranium of an idealized early gnathostome. Loosely based on a shark to show terminology for the jaws, hyoid arch, and branchial arches. The chondrocranium is also included. Gill pouches are numbered g1 to g5. (The complete color coding that will be used throughout this chapter is shown in Figure 7-4.)

## Esplanocrânio

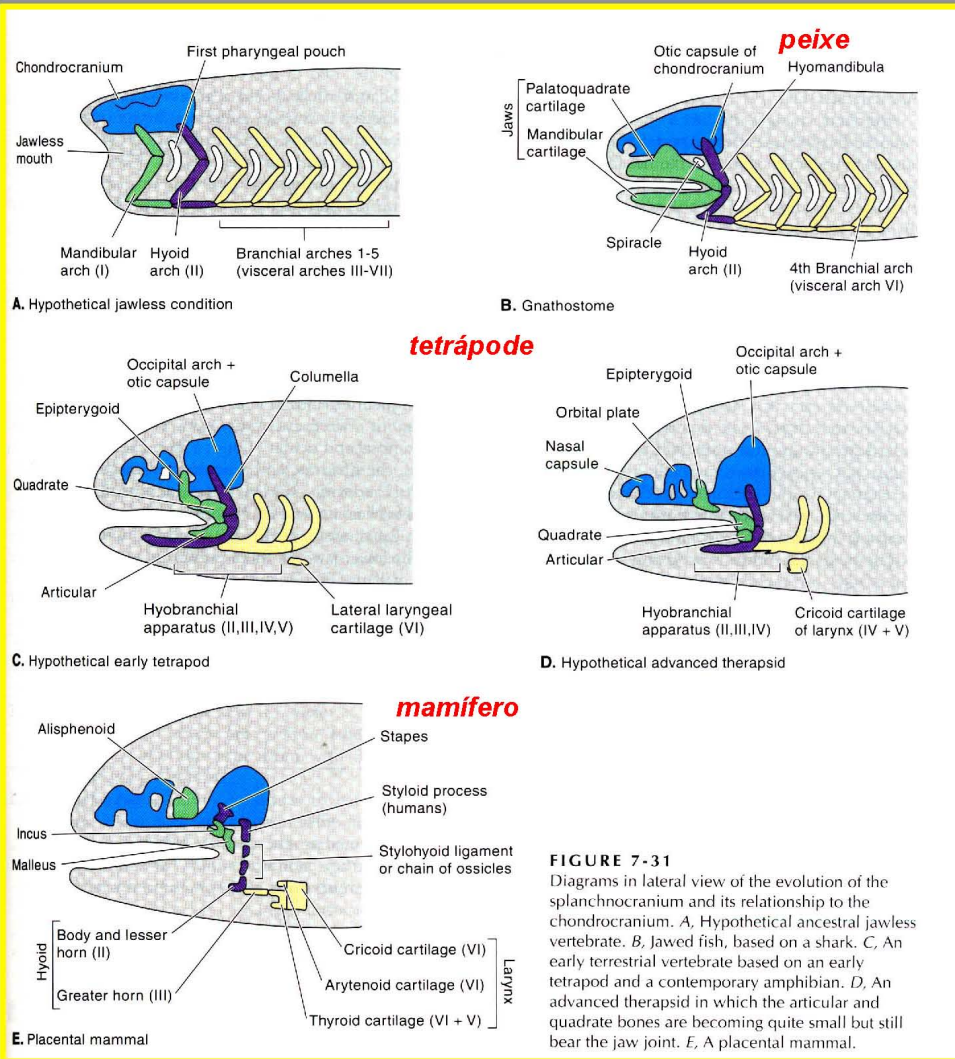




**Osteichthyes** – maxilas são ossos dérmicos aos quais os dentes estão associados

**Chondrichthyes** – maxilas são elementos do endoesqueleto cartilaginoso aos quais os dentes estão associados

# Evolução dos arcos viscerais



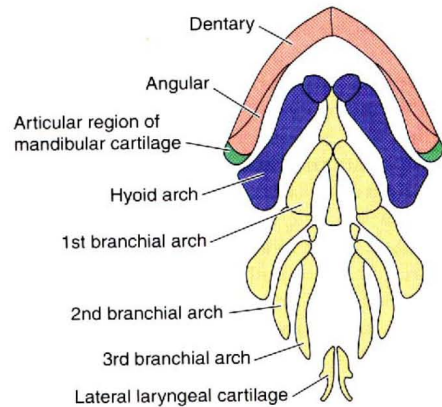
redução dos arcos,  
aproximação ao crânio

FIGURE 7-31

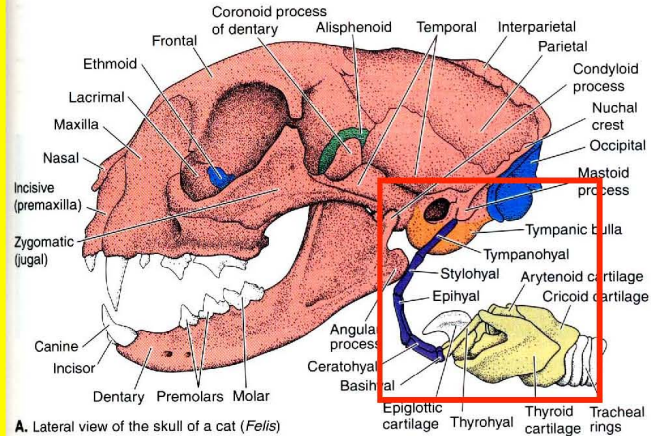
Diagrams in lateral view of the evolution of the splanchnocranium and its relationship to the chondrocranium. A, Hypothetical ancestral jawless vertebrate. B, Jawed fish, based on a shark. C, An early terrestrial vertebrate based on an early tetrapod and a contemporary amphibian. D, An advanced therapsid in which the articular and quadrate bones are becoming quite small but still bear the jaw joint. E, A placental mammal.



# Esplancnocrânio



**B.** Lower jaw and hyobranchial apparatus of *Necturus*



**A.** Lateral view of the skull of a cat (*Felis*)

**FIGURE 7-26**

Composition of the mammalian cranial skeleton as seen in a cat. See Figure 7-4 for color coding. *A.* A lateral view of the skull, lower jaw, hyoid apparatus, and larynx. *B.* A palatal view of the skull. The part of the tympanic bulla colored orange is a new cartilage-replacement bone without a homologue in reptiles. (After Walker and Homberger.)

-tetrápodes: os arcos branquiais remanescentes perderam a função respiratória;

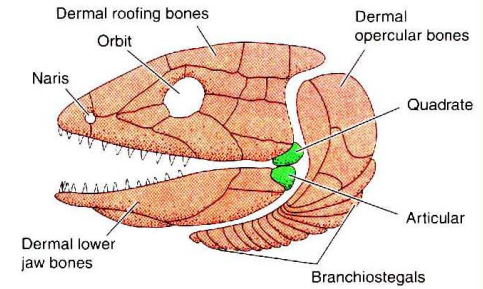
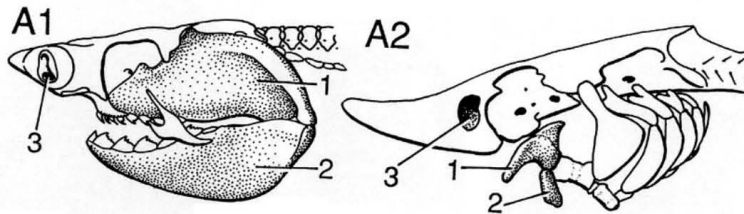
-permaneceram cartilaginosos

-associados à faringe (aparelho hióide -- sustentação da língua) e laringe (protege a traquéia)

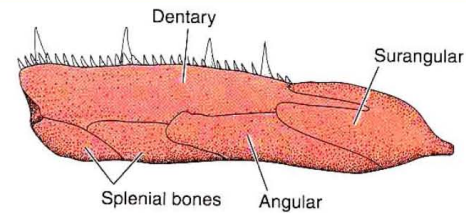


arco maxilar

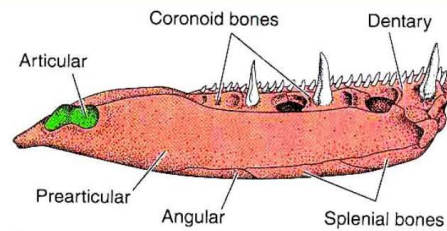
# Esplancnocrânio



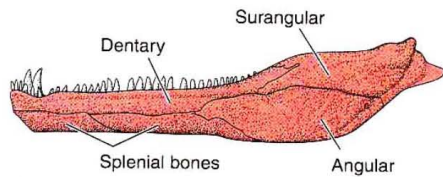
A. Dermatocranium in lateral view



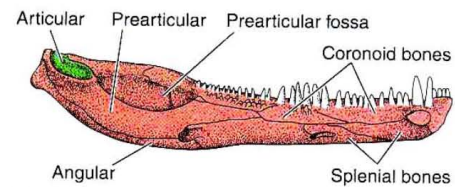
A. Choanate fish, lateral view



B. Choanate fish, medial view



C. Basal tetrapod, lateral view

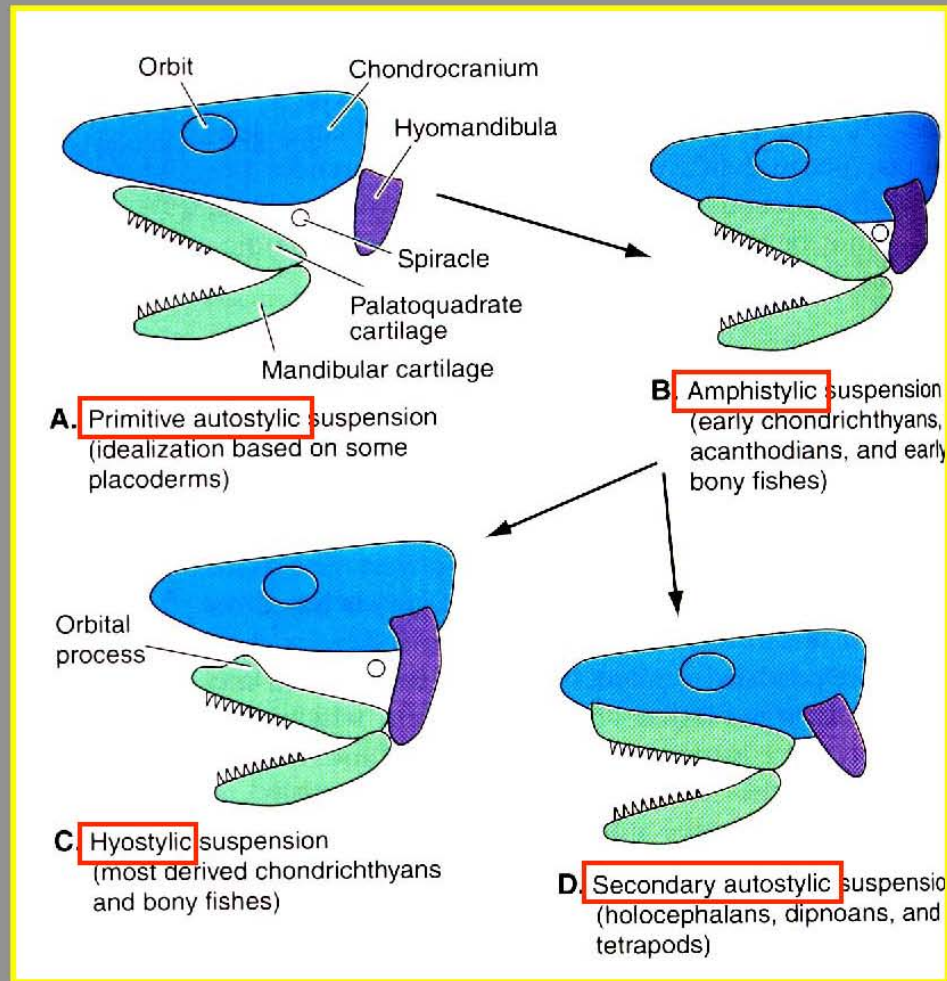


D. Basal tetrapod, medial view

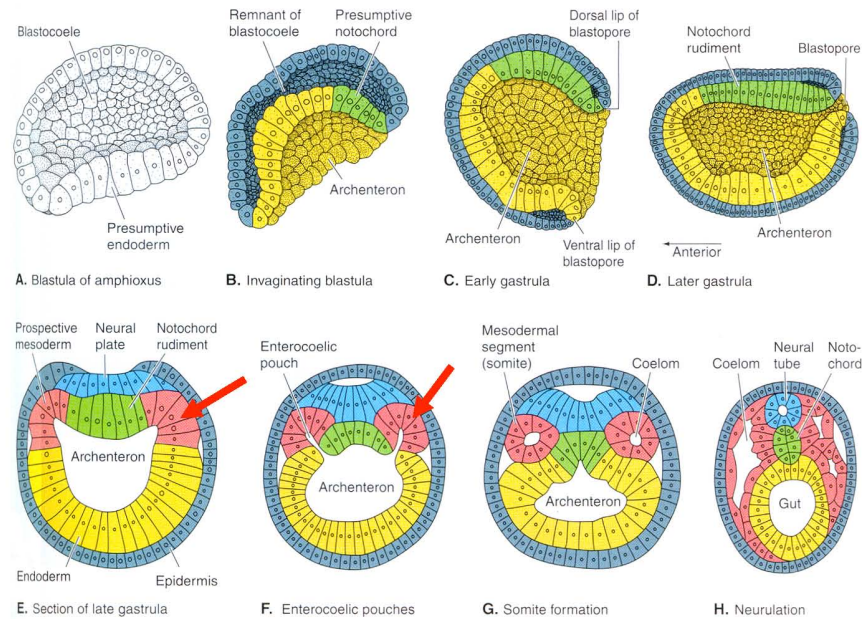
FIGURE 7-14

The lower jaw of a choanate fish (A and B) and early tetrapod (C and D) as seen in lateral view (A and C) and medial view (B and D). (After Romer and Parsons.)

## Esplanocrânio: suspensão das maxilas



# DERMATOCRÂNIO

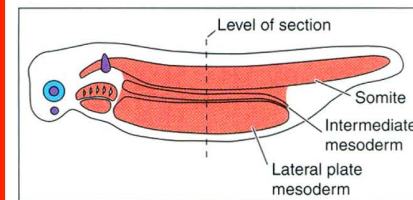


**FIGURE 4-12**

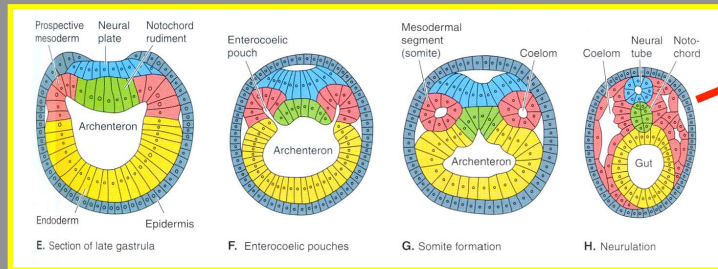
Gastrulation, mesoderm formation, and neurulation in amphioxus. *A–D*, Sagittal sections of the formation of the gastrula. *E–H*, Transverse sections through late gastrulas and neurula to show the formation of the mesoderm, notochord, and neural tube. Ectoderm is shown in blue, endoderm in yellow, presumptive notochord in green, and mesoderm in red. (*A–D*, After Conklin; *E–H*, after Hatschek.)

formação do mesoderma

células mesodérmicas  
separam-se da endoderme,  
formando dois tubos  
longitudinais

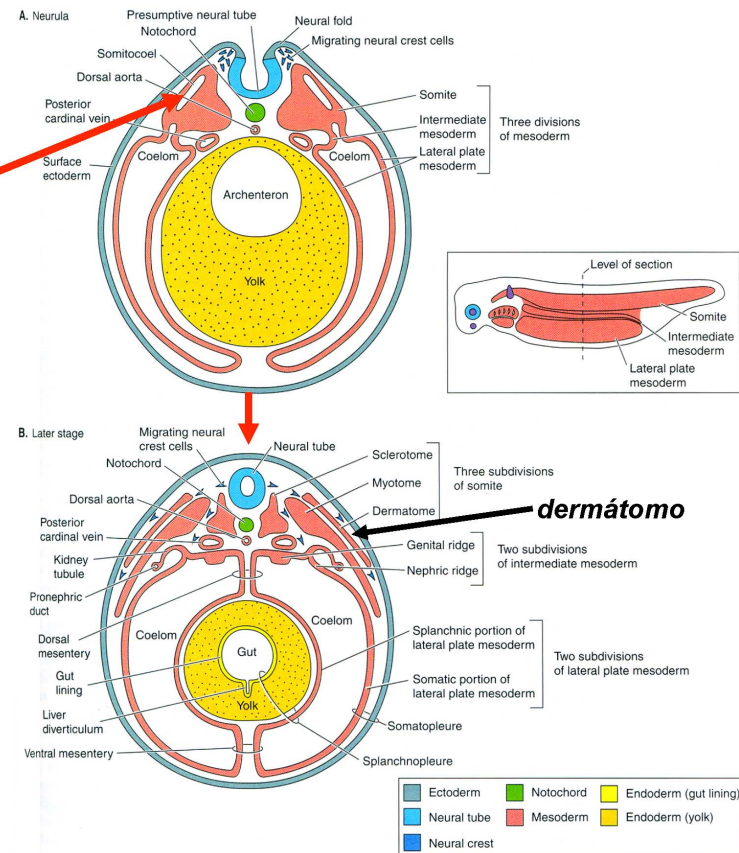


# Formação do crânio: *esqueleto dérmico*



-tubo longitudinal mesodérmico subdivide-se em epímero, mesômero e hipômero;

-epímero (=somito) se subdivide em dermátomo, miótomo e esclerótomo



**FIGURE 4-16**  
Differentiation of trunk mesoderm in an idealized amphibian embryo. **A.** Early neurula. The inset shows a lateral view and the plane of section for the figure in **A.** It also diagrams the basic organization of the three divisions of trunk mesoderm. In amphibian embryos (and other vertebrates with mesolecithal eggs) the moderate amount of yolk is incorporated into yolk-laden cells in the floor of the archenteron. **B.** Later neurula, showing the structures that develop from each somite and each germ layer. Note that each of the three divisions of trunk mesoderm diagrammed in **A** in turn gives rise to subdivisions. See text for additional descriptions.

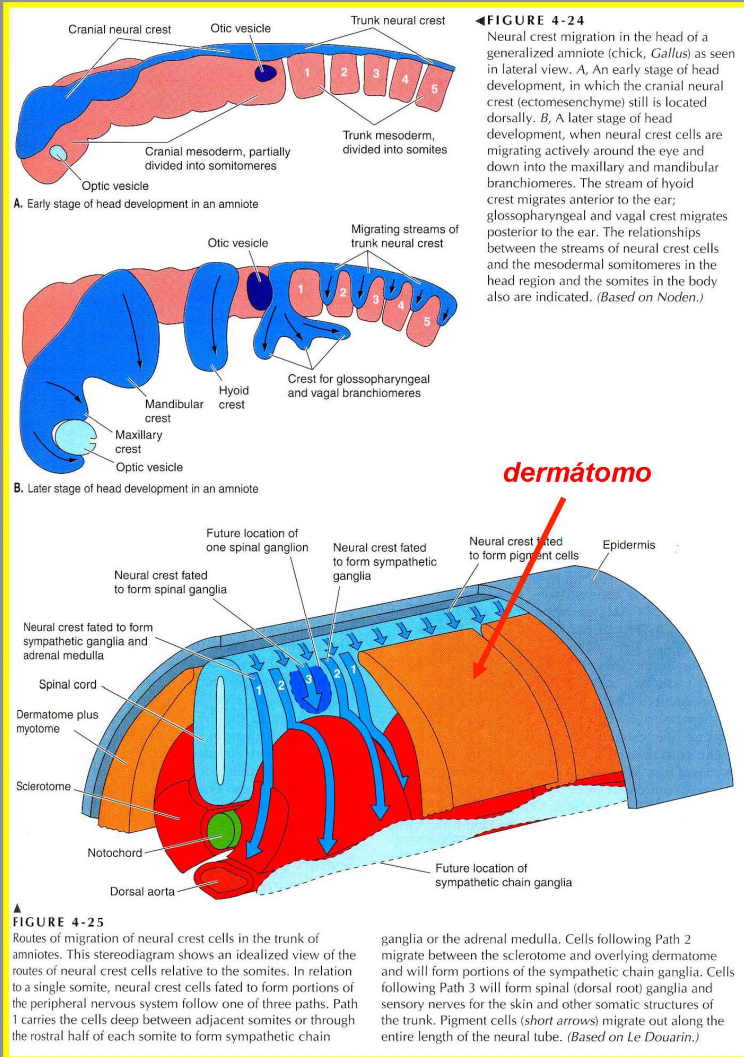


## Tipos de ossos

1) esqueleto dérmico: superficial, *dermatômo* (somito) e *crista neural* (?)

2) esqueleto endocondral: profundo, *crista neural*, *esclerôto* (somito → vértebras) e *mesoderma de placa lateral* (hipômero)

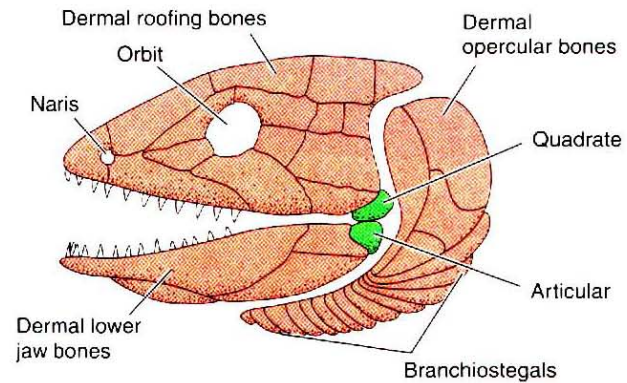
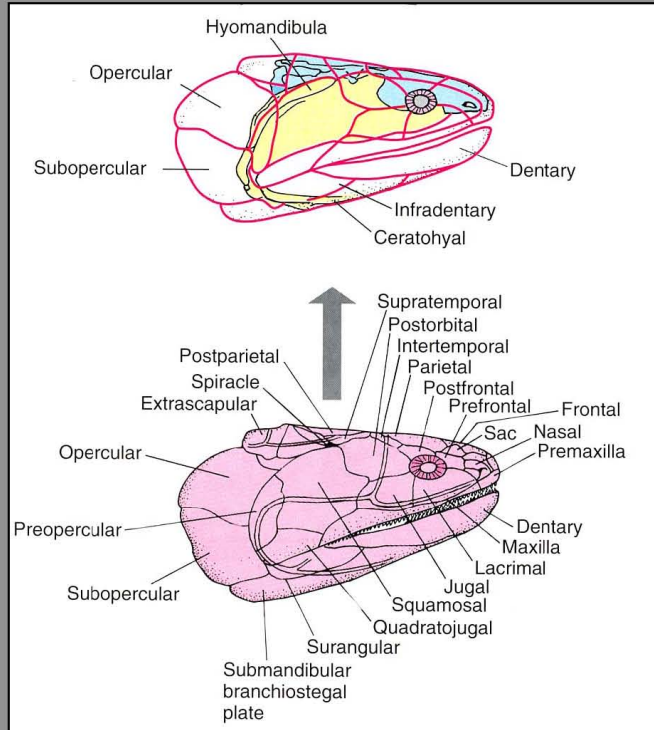
-um tipo de osso não se transforma em outro





## Osteichthyes: esqueleto dérmico

### - ossos dérmicos recobrendo cabeça

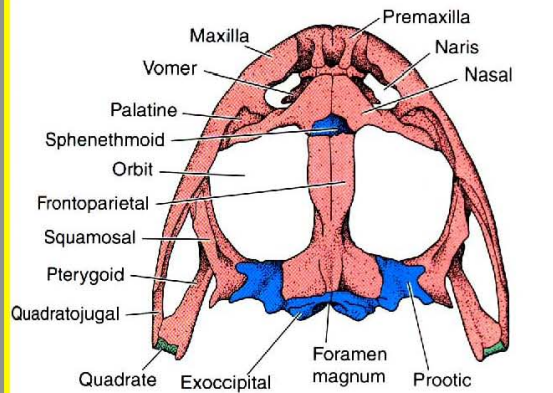


A. Dermatocranium in lateral view

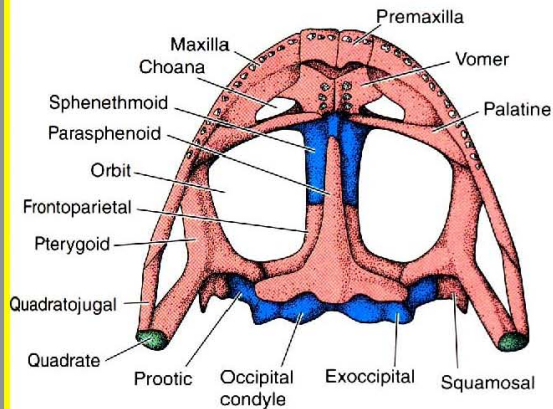
várias séries de ossos dérmicos primitivamente recobrem o neurocrânio :

- 1) teto craniano
- 2) série do palato
- 3) paraesfenóide (assoalho ventral do neurocrânio)
- 4) série mandibular
- 5) série opercular
- 6) série gular
- 7) série orbital

## Divisão do esqueleto: Crânio



A. Dorsal view of the skull of *Rana*



B. Palatal view of the skull of *Rana*

**FIGURE 7-16**

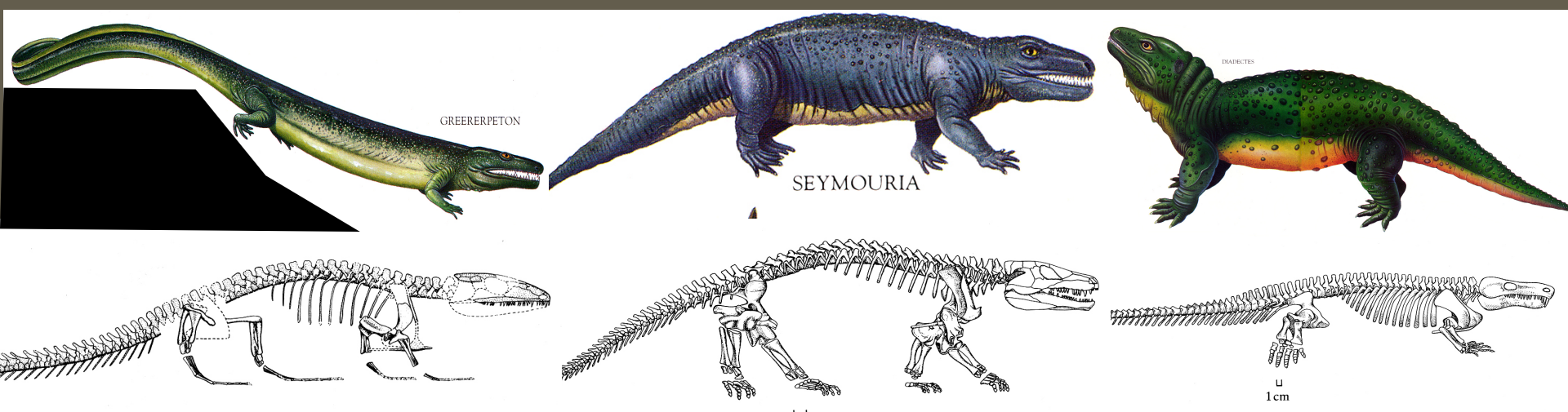
Dorsal and palatal views of the skull of a bullfrog, *Rana*.

-anfíbio: crânio reduzido, órbitas grandes; girinos com crânio cartilaginoso

Smithson (1982):

Batrachomorpha (Temnospondyli e Lepospondyli) **Exoccipitais proeminentes, pleurocentro**

Reptiliomorpha (Anthracosauria, Seymouriamorpha, Diadectomorpha) **Opistóticos proeminentes, intercentro**

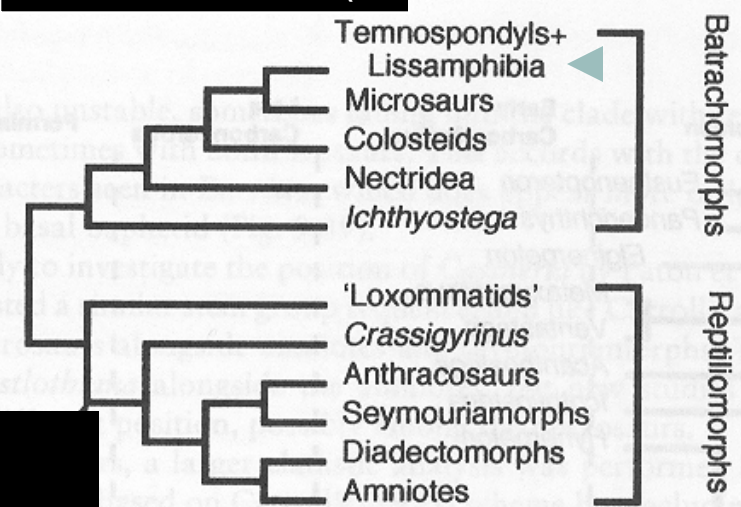


## BATRACHOMORPHA

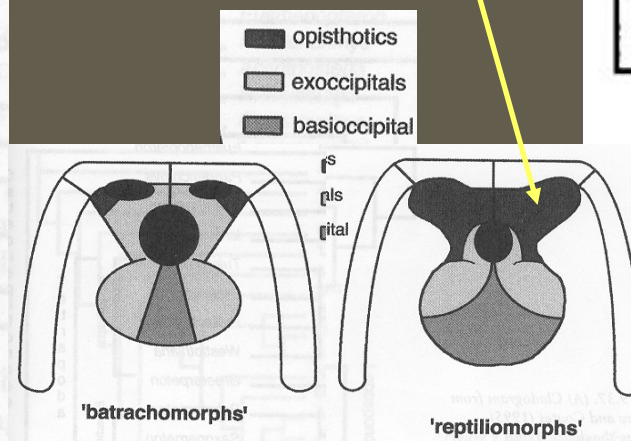
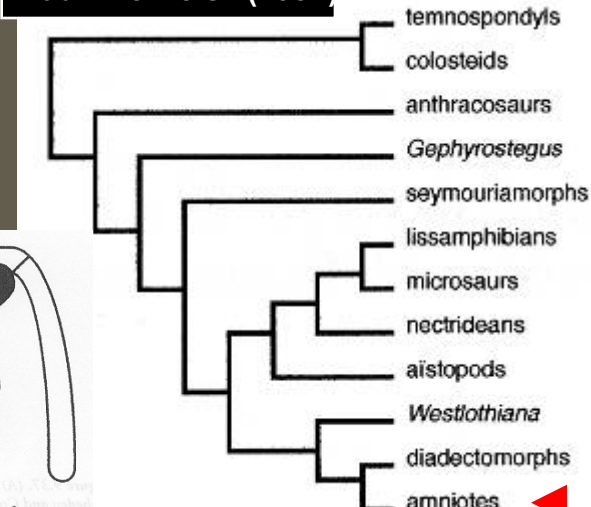
## REPTILIOMORPHA

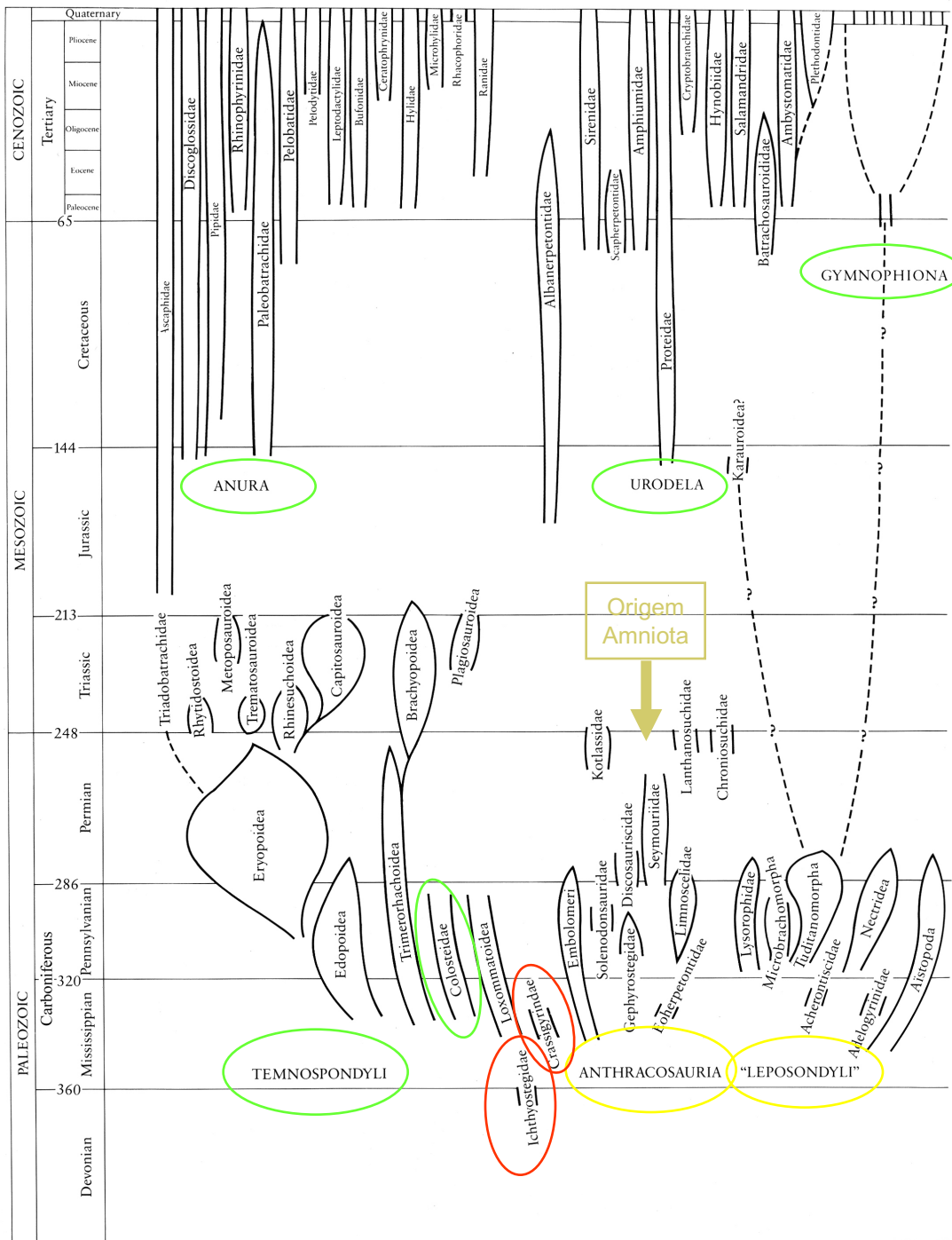
Opistóticos proeminentes conectados ao dermatocranio

Panchen e Smithson (1988)



Laurin e Reisz (1997)





# Tetrápodes “Stegocéfalos”

**Formam um grupo parafilético de Tetrápodes primitivos que incluem:**

**“Anfíbios Tetrapodomorfos basais”**

1º Tetrápodes do Devoniano  
(*Elginerpeton*, *Ichthyostega*, *Acanthostega*)

1º Tetrápodes do Carbonífero Inferior  
(*Crassigyrinus*)

**“Anfíbios batracomorfos”**

Lepospondílios, Temnospondílios que são Tetrápodes do Carbonífero e Permiano

Lissamphibia que aparecem na base do Jurássico

**“Anfíbios reptiliomorfos”**

Anthracossauros, Seymouriamorfos, Diadectomorfos e Amniota

Todos com origem no Carbonífero Superior



# Crânio dos Amniota: aberturas temporais

-aberturas permitiram maior união entre a musculatura adutora mandibular e o crânio:  
aumento de volume e eficiência na mastigação

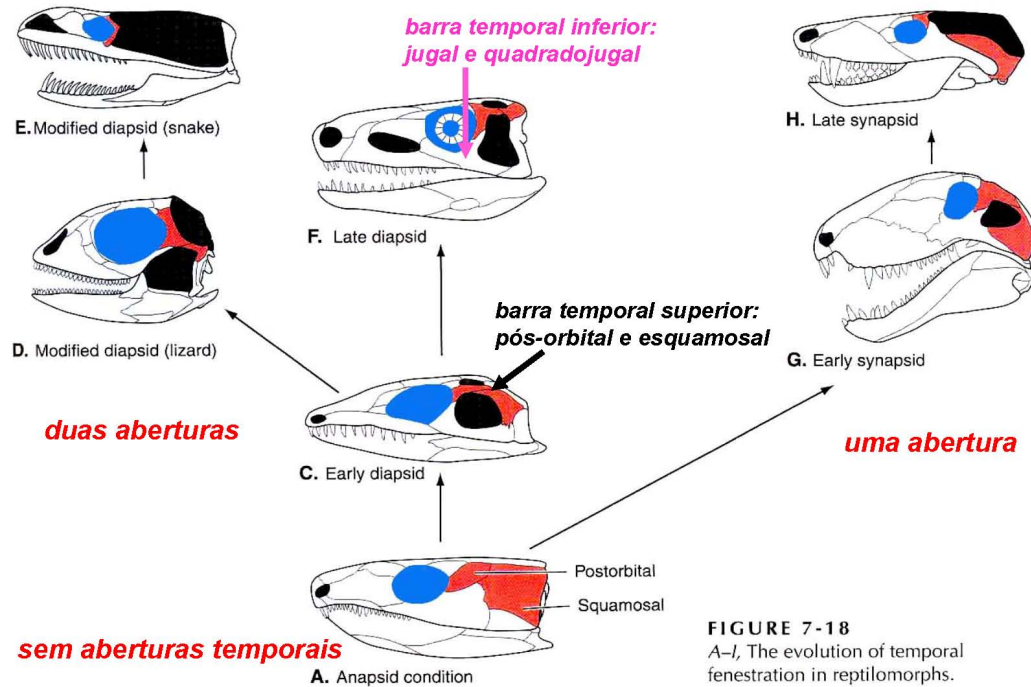
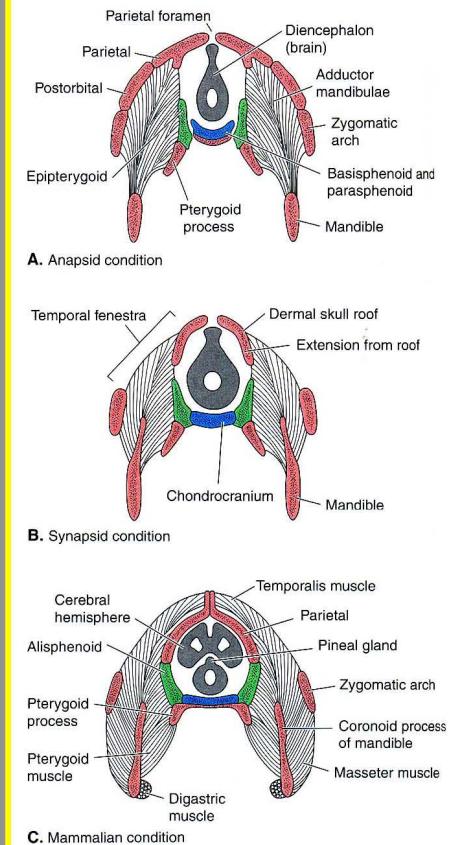
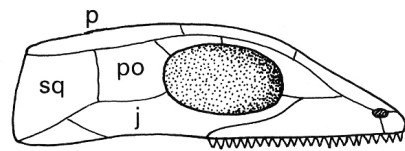


FIGURE 7-18  
A–I, The evolution of temporal fenestration in reptilomorphs.

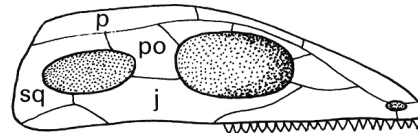


# OS 4 TIPOS BÁSICOS DE FENESTRAÇÃO DO CRANIO NOS AMNIOTA

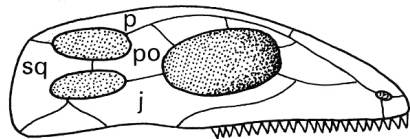
- *Hylonomus lyelli* é um anapsida.
- Os taxons anapsidas deveriam ser os primitivos?



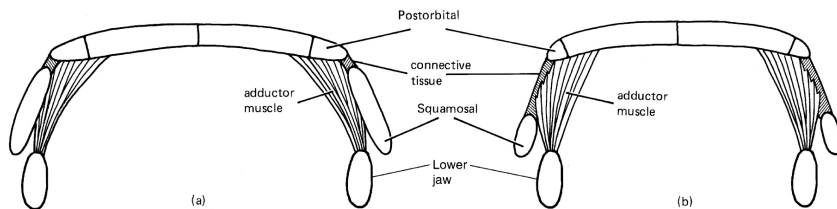
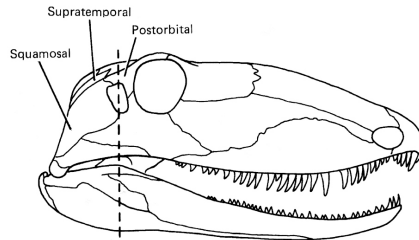
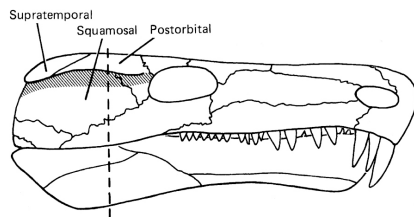
(a)



(b)

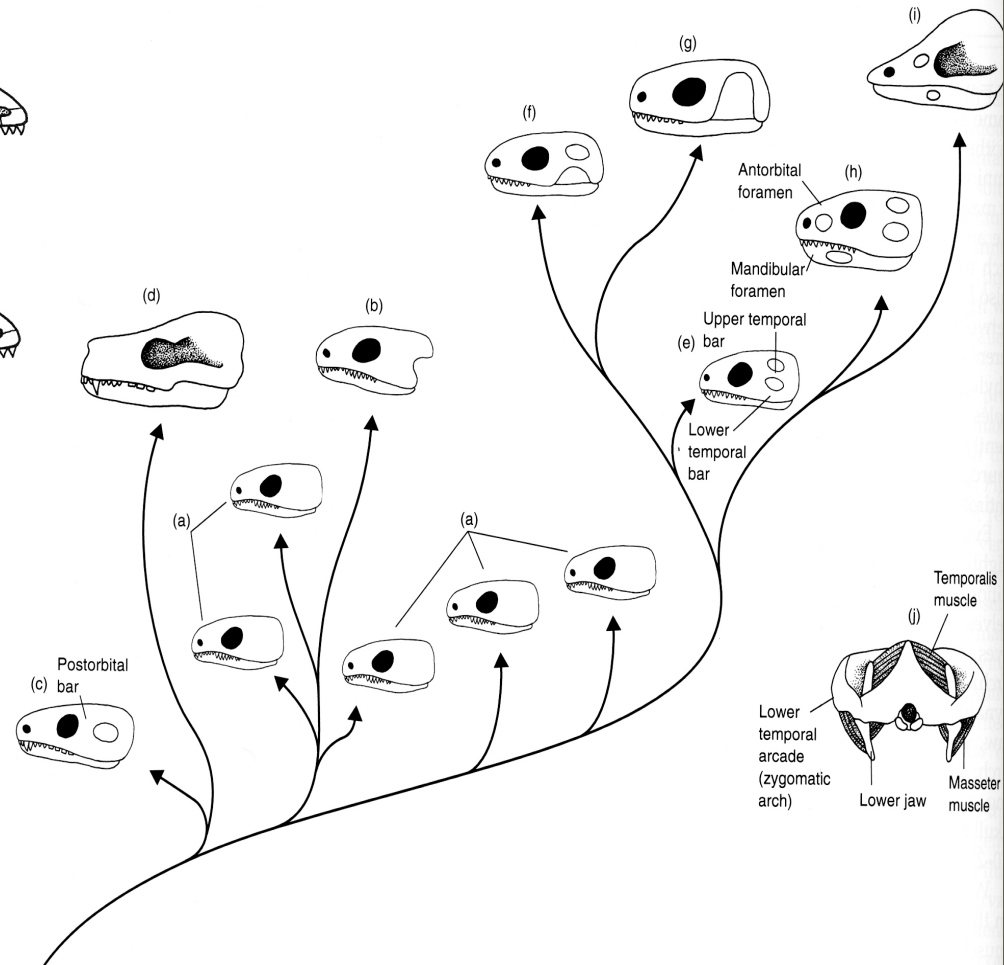


(c)



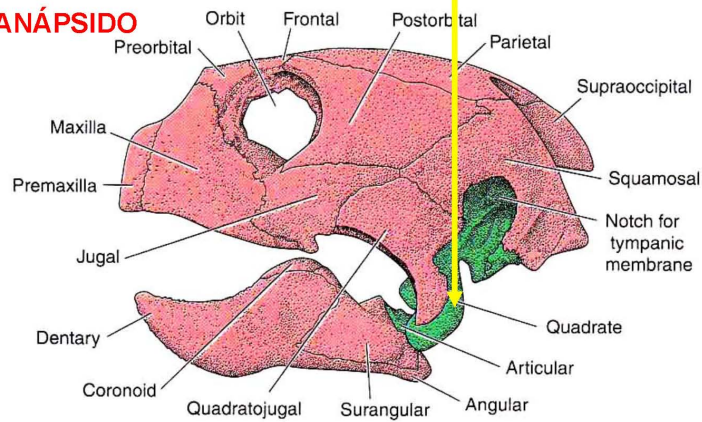
(a)

(b)



monimostilia: quadrado firmemente articulado

### ANÁPSIDO



C. Lateral view of *Caretta*

(ossificação intensa)

### DIÁPSIDO MODIFICADO

(ossos leves, sem dentes)

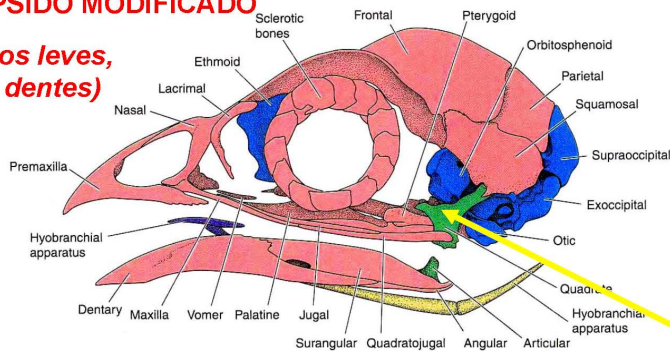


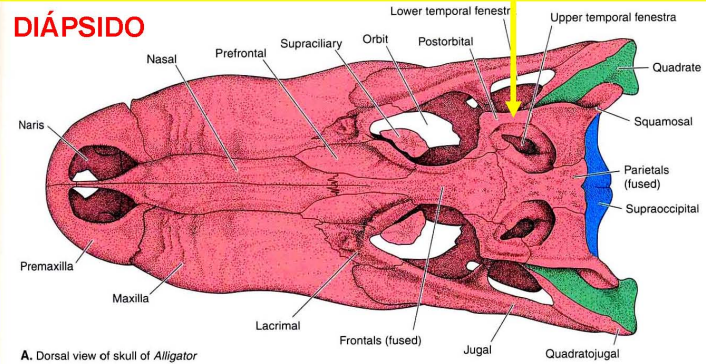
FIGURE 7-22

A lateral view of the skull and lower jaw of a gosling, *Anser ferus*. Most of the bones of the braincase are fused together in an adult goose. (After Heilman.)

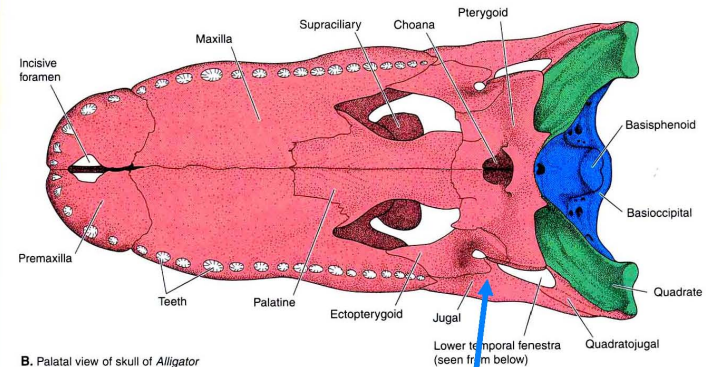
## Crânio

barra temporal superior

### DIÁPSIDO



A. Dorsal view of skull of Alligator



B. Palatal view of skull of Alligator

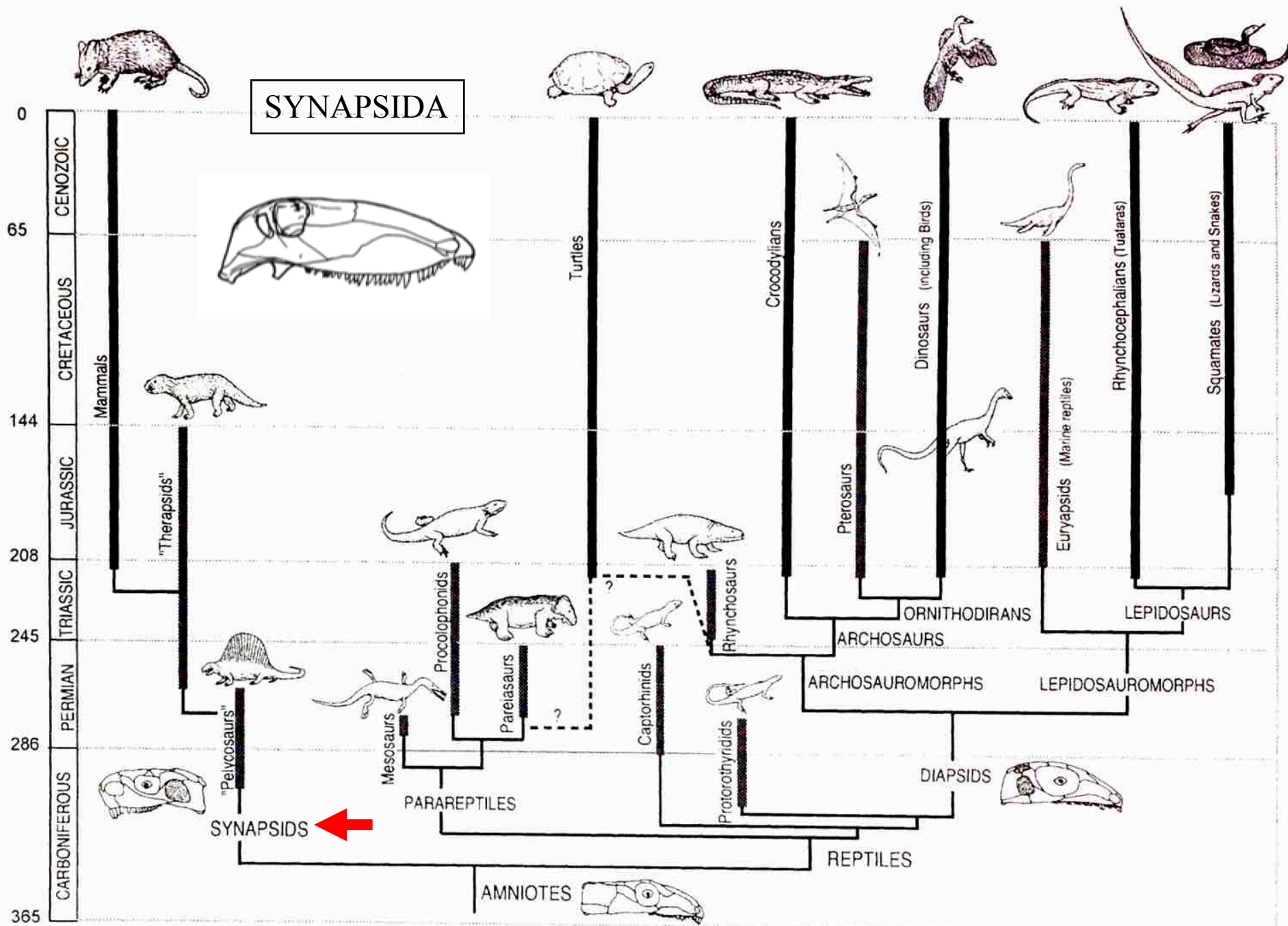
FIGURE 7-20

Dorsal (A) and palatal (B) views of the skull of an alligator.

barra temporal inferior

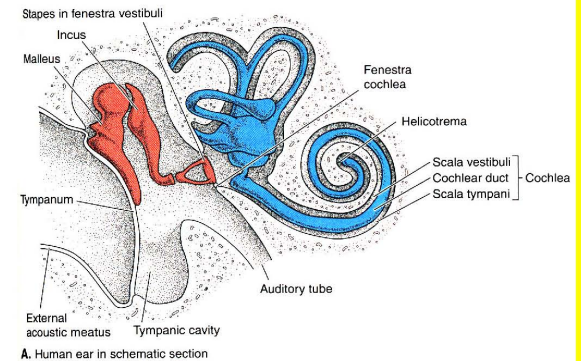
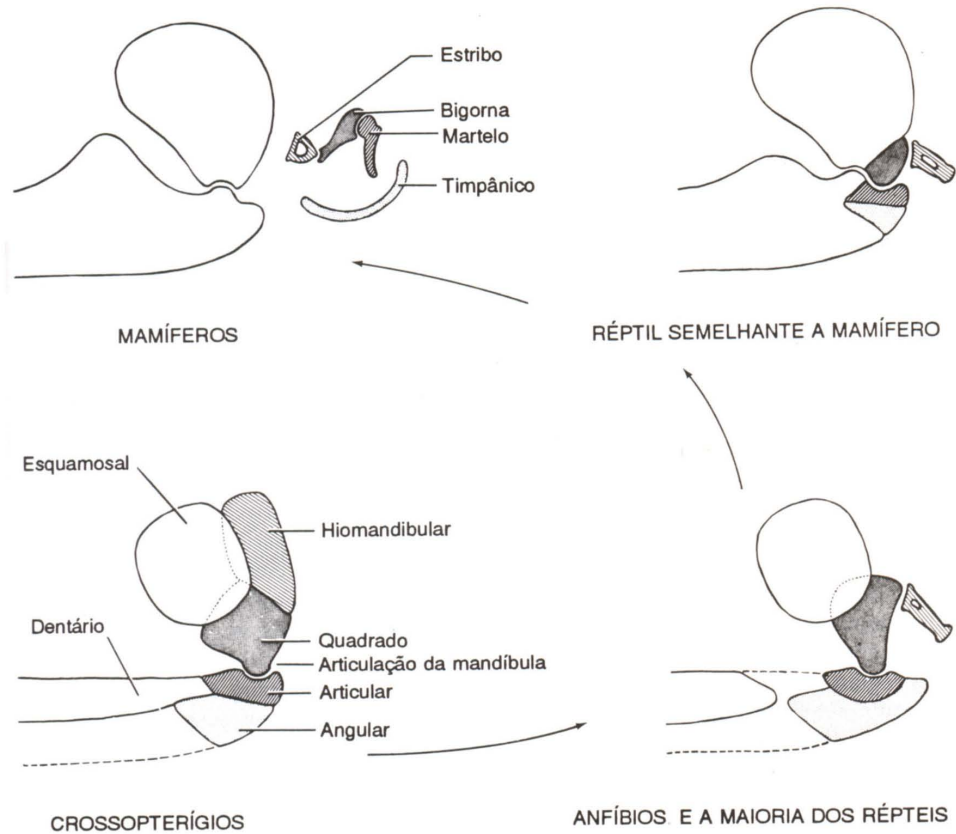
estreptostilia: quadrado mais solto







# Evolução do ouvido médio

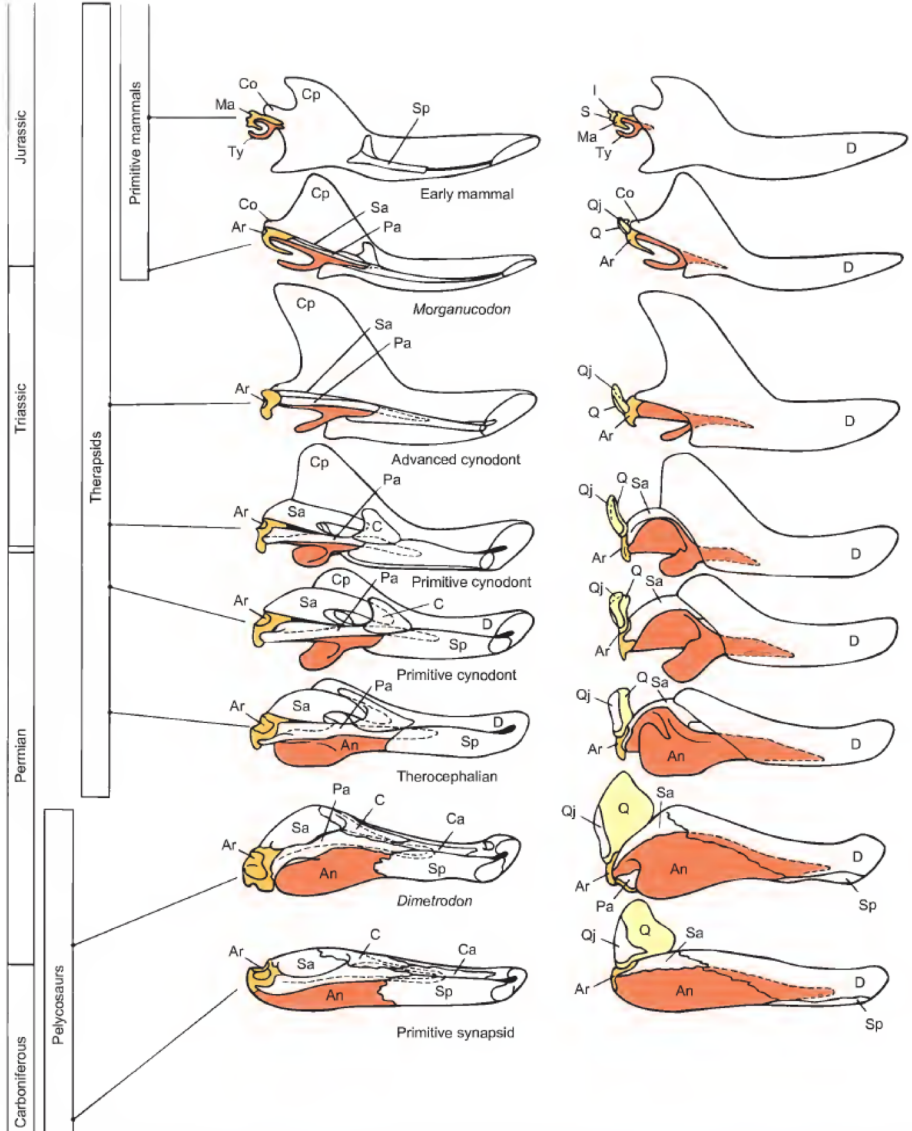


articular → martelo  
quadrado → bigorna  
hiomandíbula → columela  
 (tetrápodes)  
 → estribo  
 (mamíferos)

**FIGURA 8-13** FILOGENIA DA ARTICULAÇÃO DA MANDÍBULA E ESTRUTURAS ASSOCIADAS.

- articular → martelo
- cuadrado → bigorna
- hiomandíbula → columela
  - (tetrápodes)
  - estribo
  - (mamíferos)

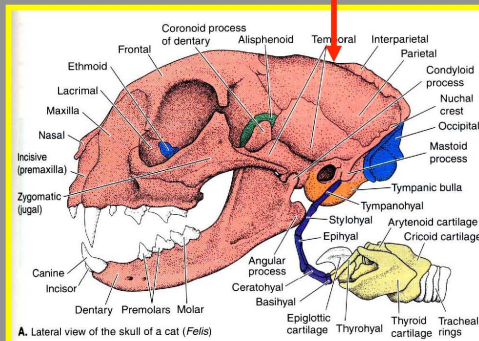
**E.** Detail of area shown in D



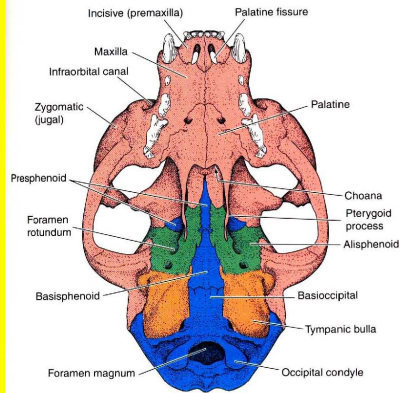
# Crânio

## mamífero

### crista sagital



A. Lateral view of the skull of a cat (*Felis*)

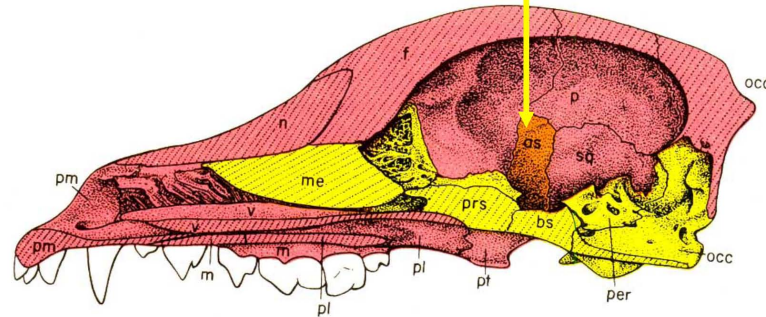


B. Palatal view of the skull of a cat (*Felis*)

**FIGURE 7-26**  
Composition of the mammalian cranial skeleton as seen in a cat. See Figure 7-4 for color coding. A, A lateral view of the skull, lower jaw, hyoid apparatus, and larynx. B, A palatal view of the skull. The part of the tympanic bulla colored orange is a new cartilage-replacement bone without a homologue in reptiles. (After Walker and Hemberger.)

## SINÁPSIDO MODIFICADO

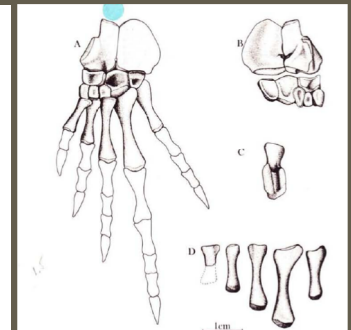
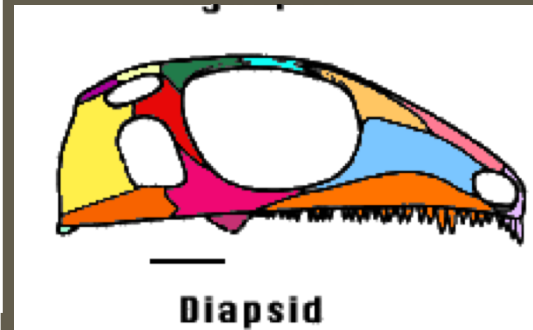
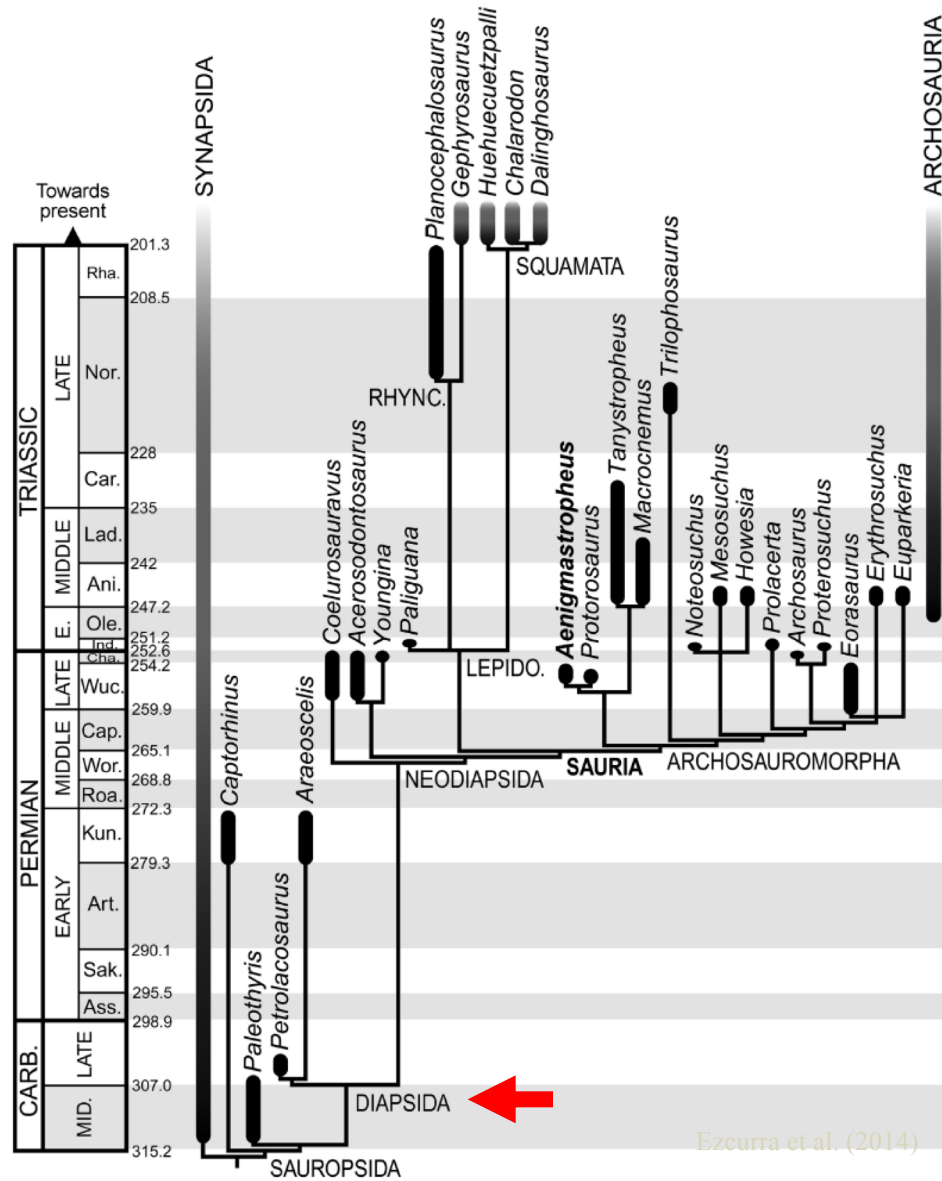
### alisfenóide = epipterigóide primitivo



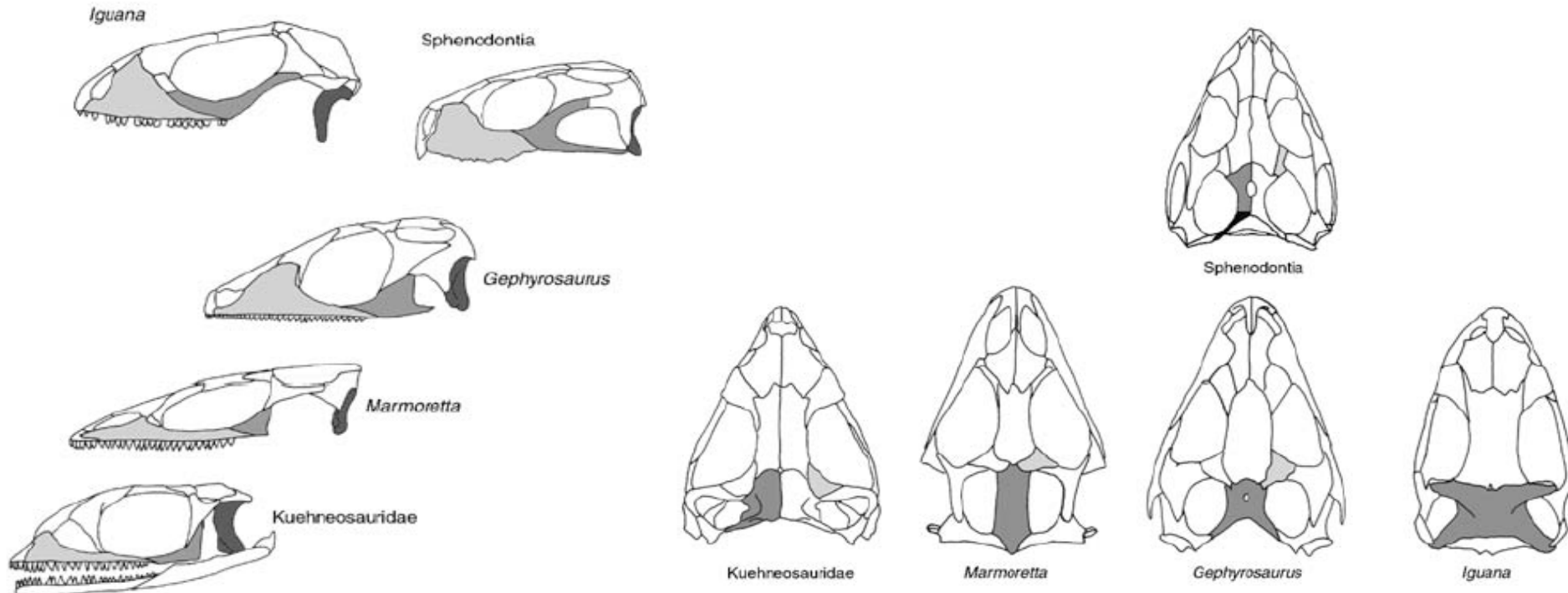
**Figura 183.** Corte sagital mediano do crânio de cão. Cores como na Figura 166. As linhas paralelas diagonais indicam ossos seccionados. Ver-se-á que a maior parte dos ossos que formam as paredes da cavidade encefálica derivou de elementos dérmicos (f, p, sq), e ainda, parte do occipital é embriologicamente de origem dérmica. Abreviações: as, alisfenóide; bs, basisfenóide; f, frontal; m, maxila; me, mesetmóide; n, nasal; occ, occipital; p, parietal; per, periótico; pl, palatino; pm, pré-maxila; prs, presfenóide; pt, pteri-góide; sq, esquamosal; v, vômer.

- ossos turbinados na cavidade nasal expandida;
- narinhas fundidas;
- palato secundário desenvolvido, coanas posteriores;
- mandíbula: apenas o osso dentário.

# DIAPSIDA



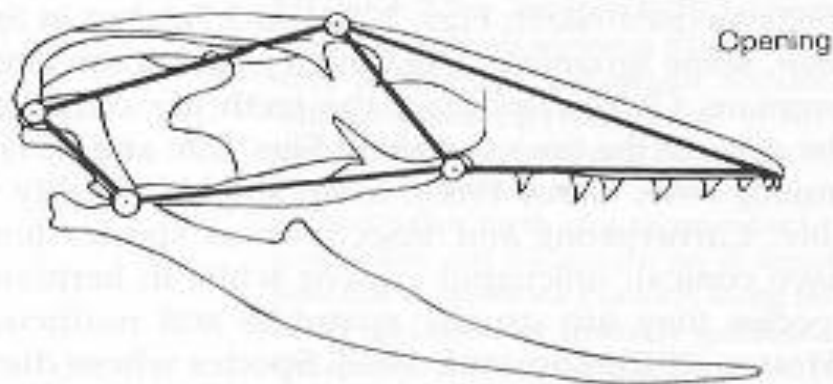
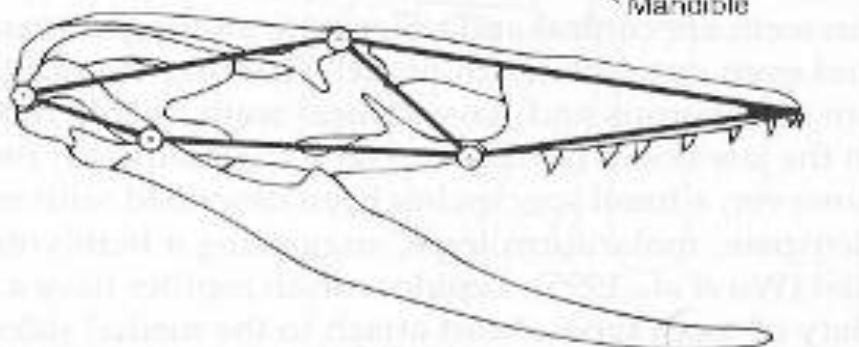
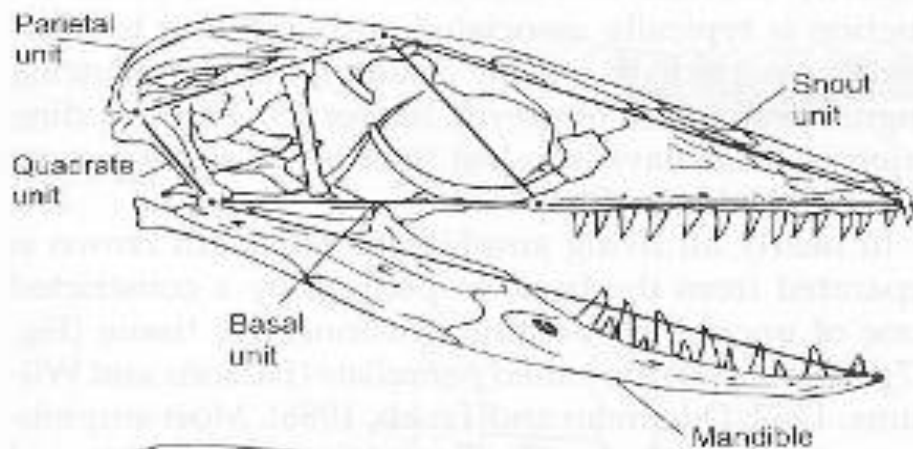




### Algumas series de transformações características do clado Lepidosauria

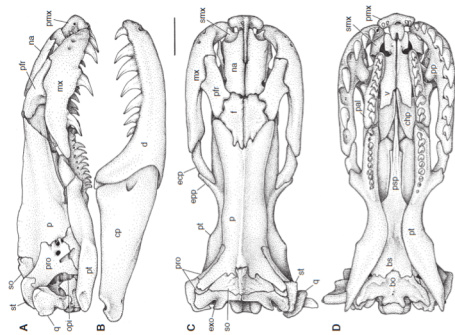
- Aumento do processo ascendente da maxila
- Perda do processo posterior do jugal
- Redução do quadratojugal

- Perda do tabular
- frontais fusionados
- parietais fusionados
- sutura fronto-parietal reta



SCLEROGLOSSA

Aumento da Kinese craniana (streptostilia)



<https://www.youtube.com/watch?v=DQw5G51tHzU>

