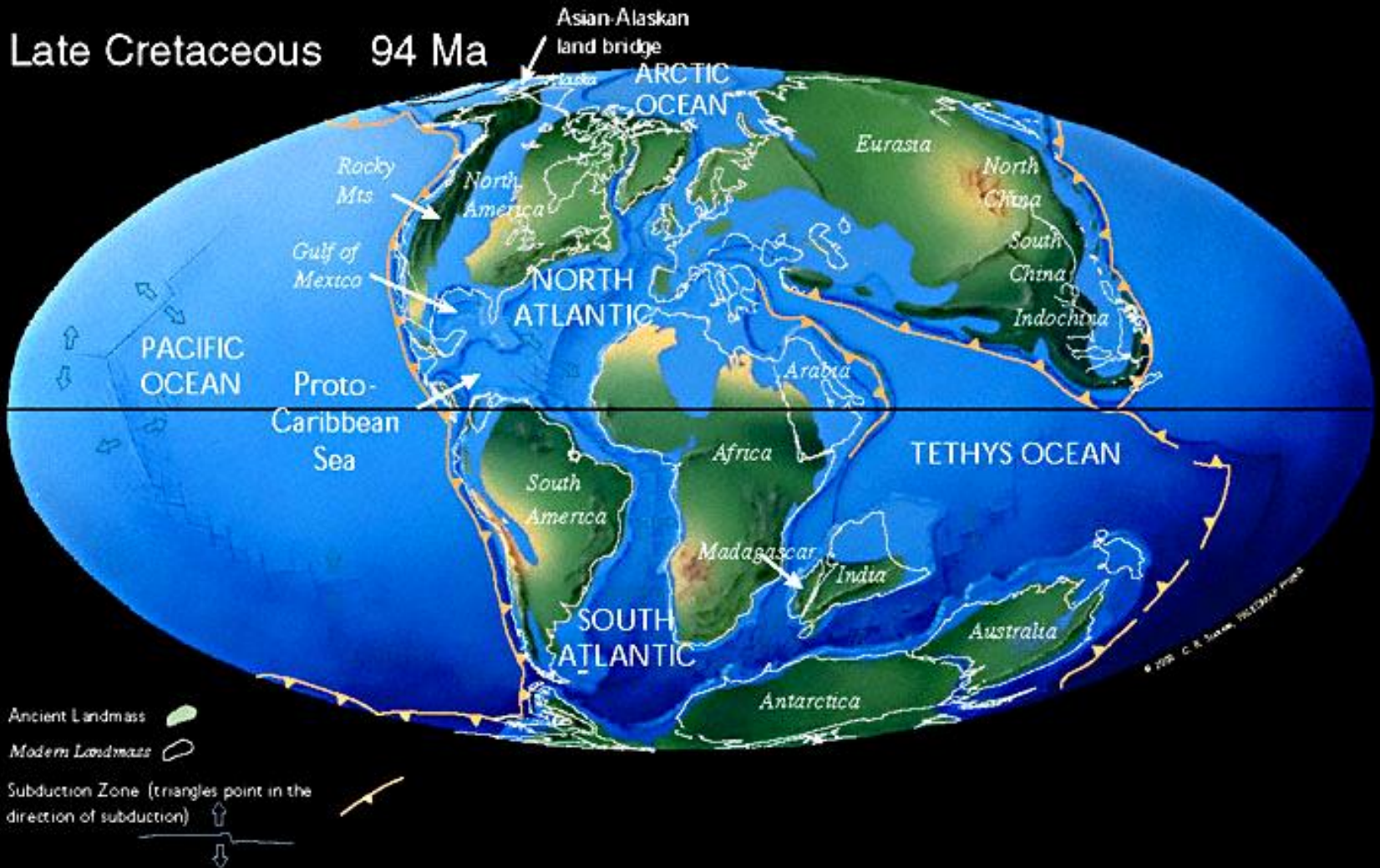


# Paleontologia 2020 (Aula 12): *Vida na terra (Cenozoico)*



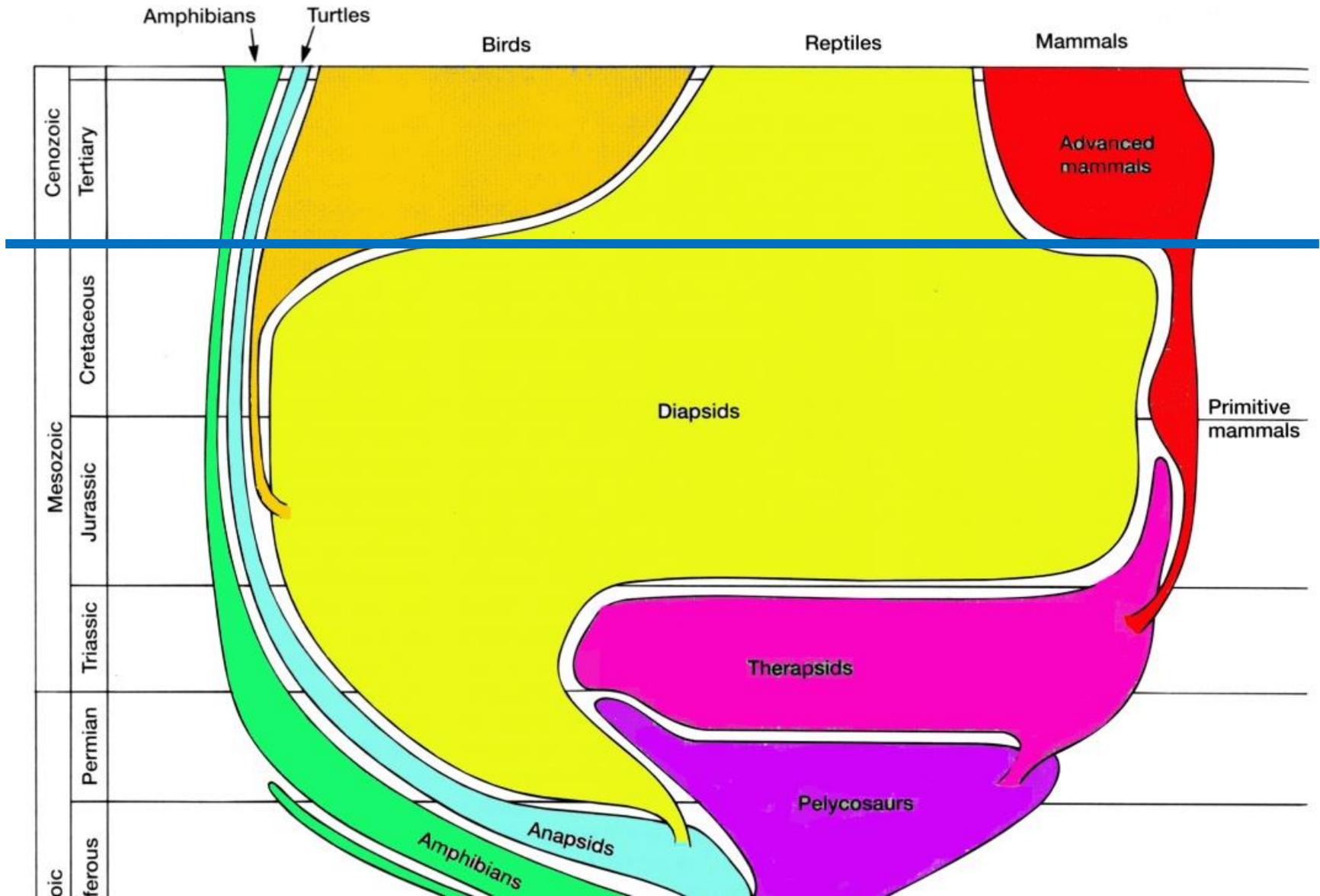


# Paleogeografia próxima à atual: Neogondwana, Américas separadas - Fechamento do Mar the Tethys



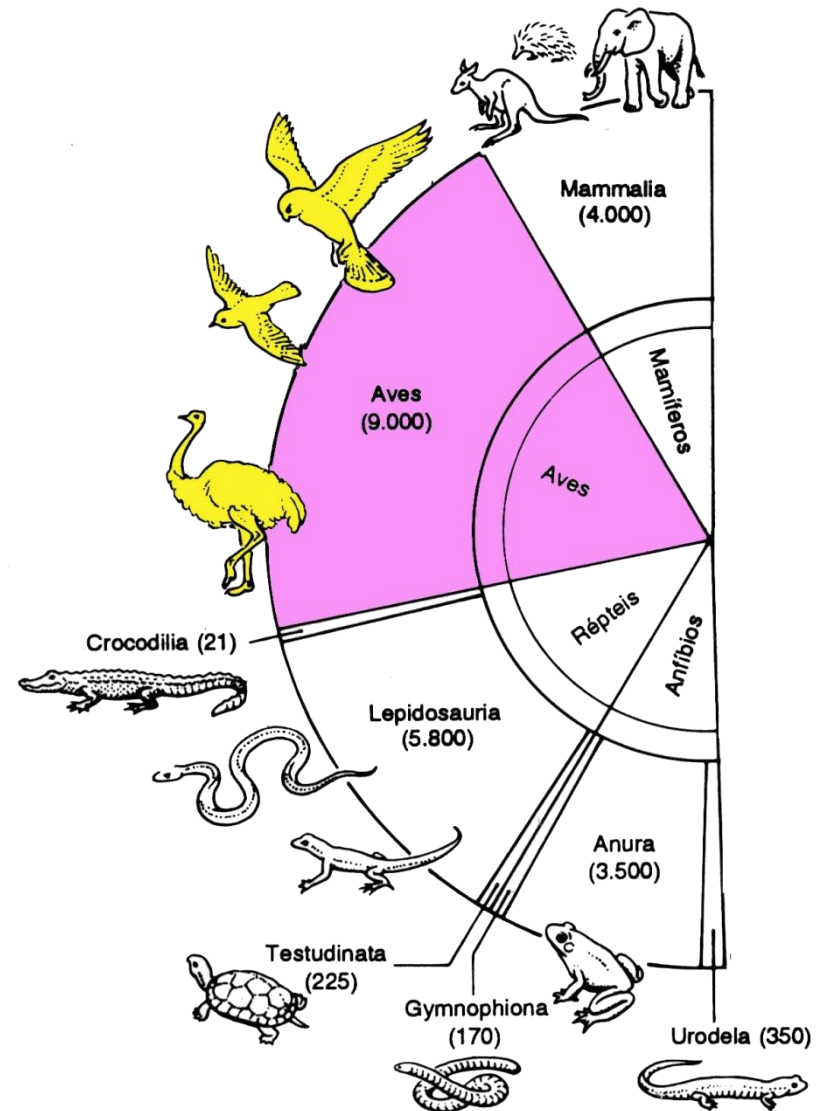
# Amniota (Carbonífero sup. – Recente)

Irradiação pós extinção K-T



# Aves (Jurássico sup. - Recente)

Mais diverso grupo de tetrápodos viventes (mais de 10 mil espécies)



## **Aves** (Jurássico sup. - Recente)

Registro fóssil parco: fragilidade do esqueleto e habitat continental

Em geral restrito à ambientes aquáticos





# Chelidae (Cretáceo sup. – Recente)

Formas fósseis e recentes restritas à Austrália e América do Sul



*Hydromedusa*



*Chelodina*



*Chelus*





# Podocnemidae (Cretáceo inf. – Recente)

Formas atuais restritas à Amazônia e Madagascar



*Podocnemis*

*Erymnochelys*

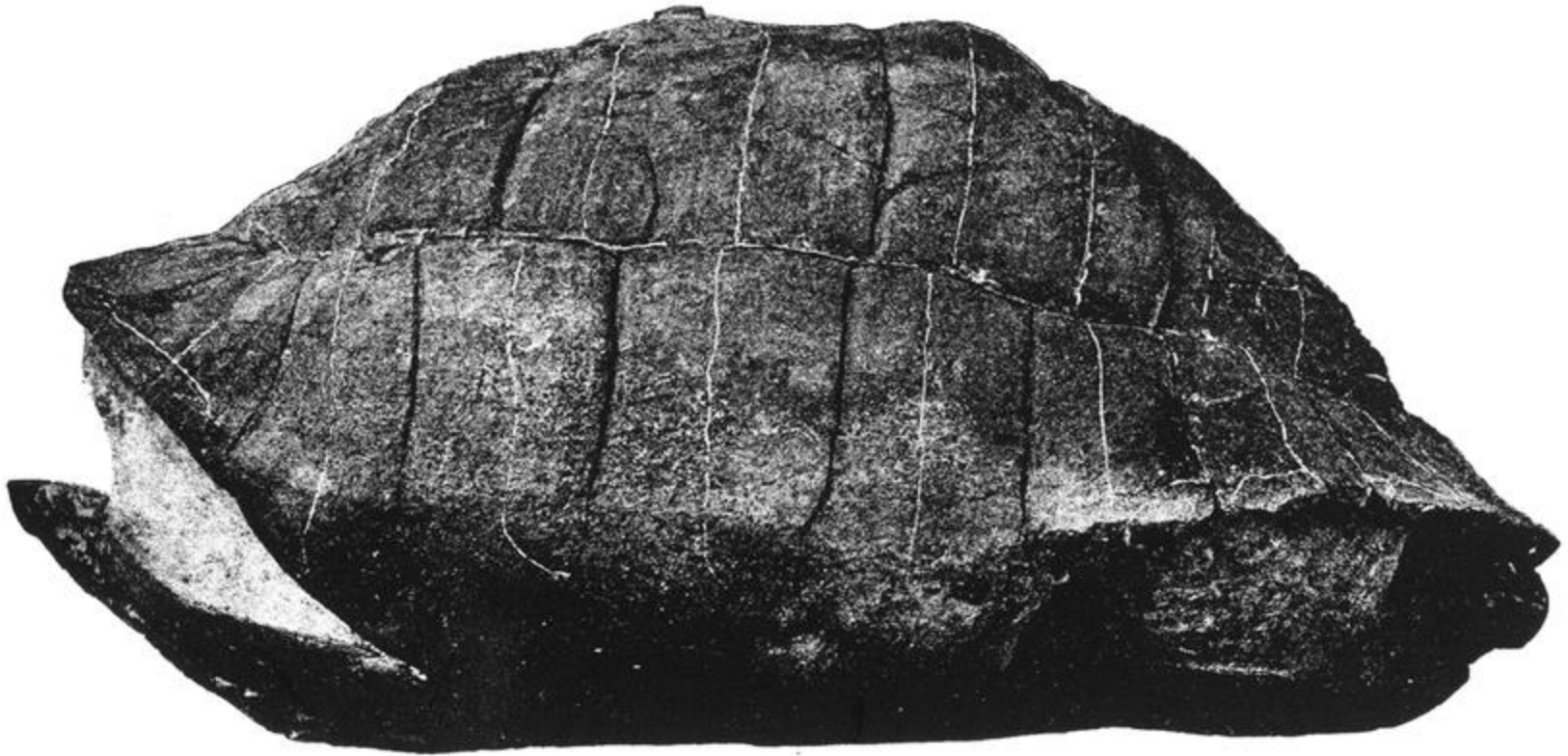




**Cryptodira** (Jurássico - Recente)

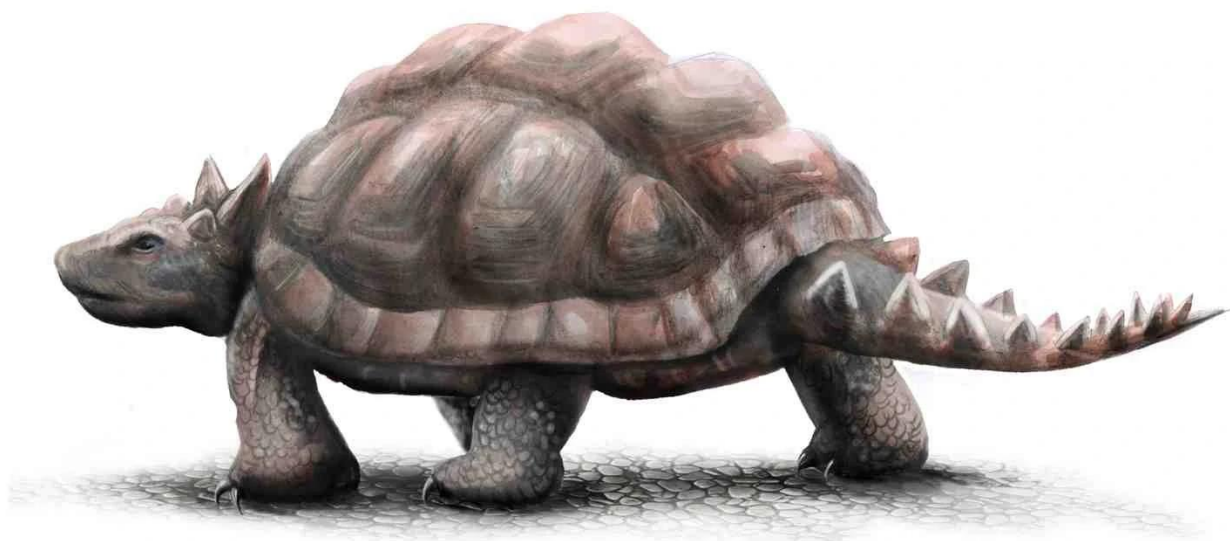
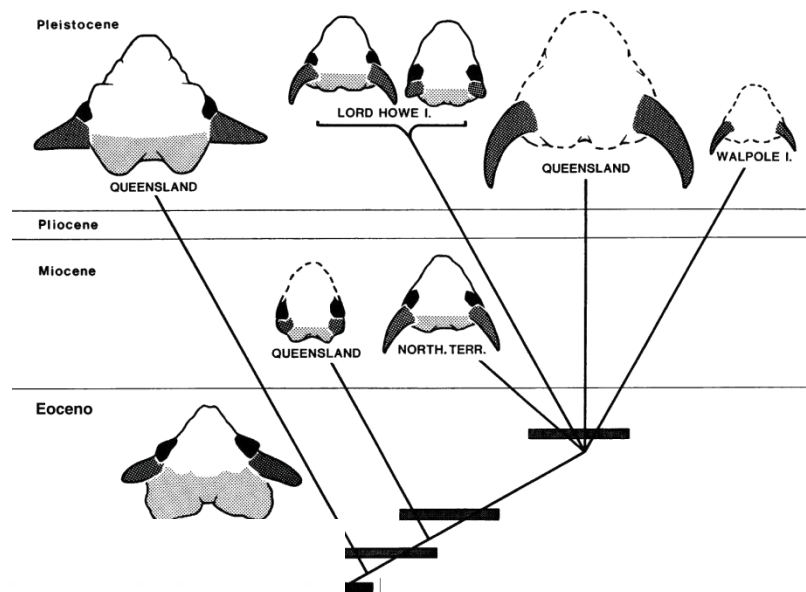
Testudinidae: "jabotis"

*Adrianus*: Eocendo dos EUA



# Cryptodira (Jurássico inf. - Recente)

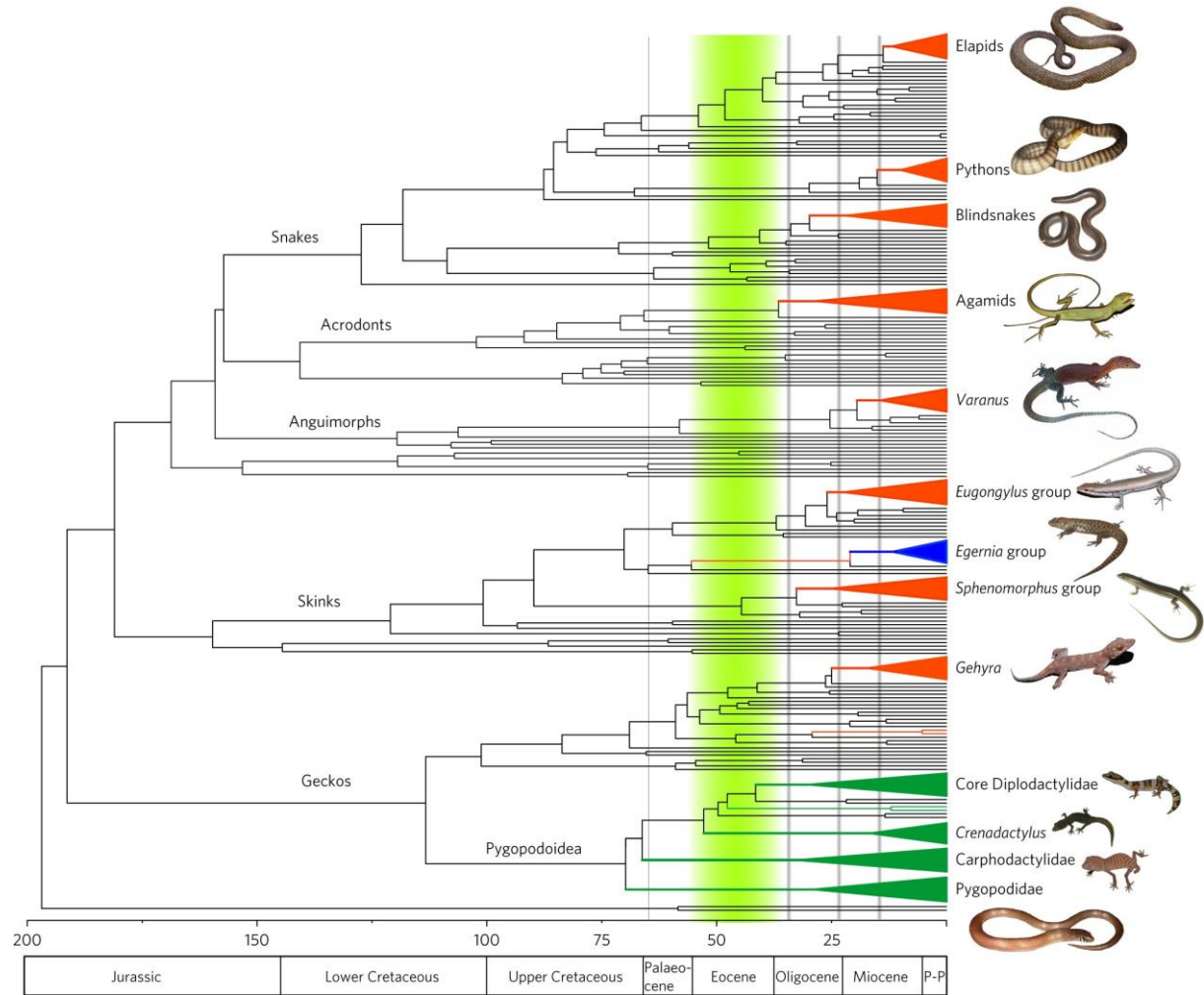
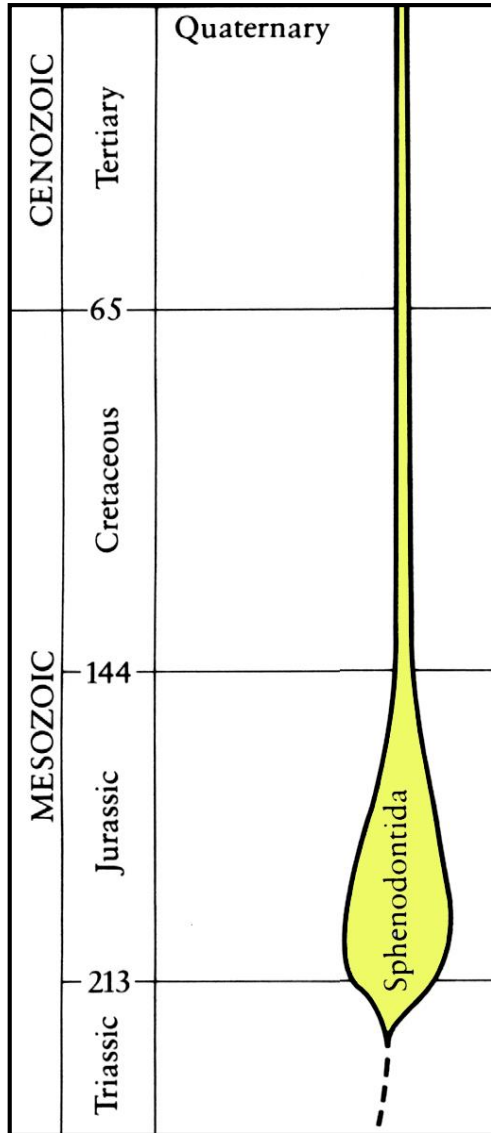
Meiolanidae: Argentina (Cretáceo/Eoceno) e Austrália (Oligoceno-Pleistoceno)



*Niolamia*  
Cretáceo/Eoceno  
Argentina

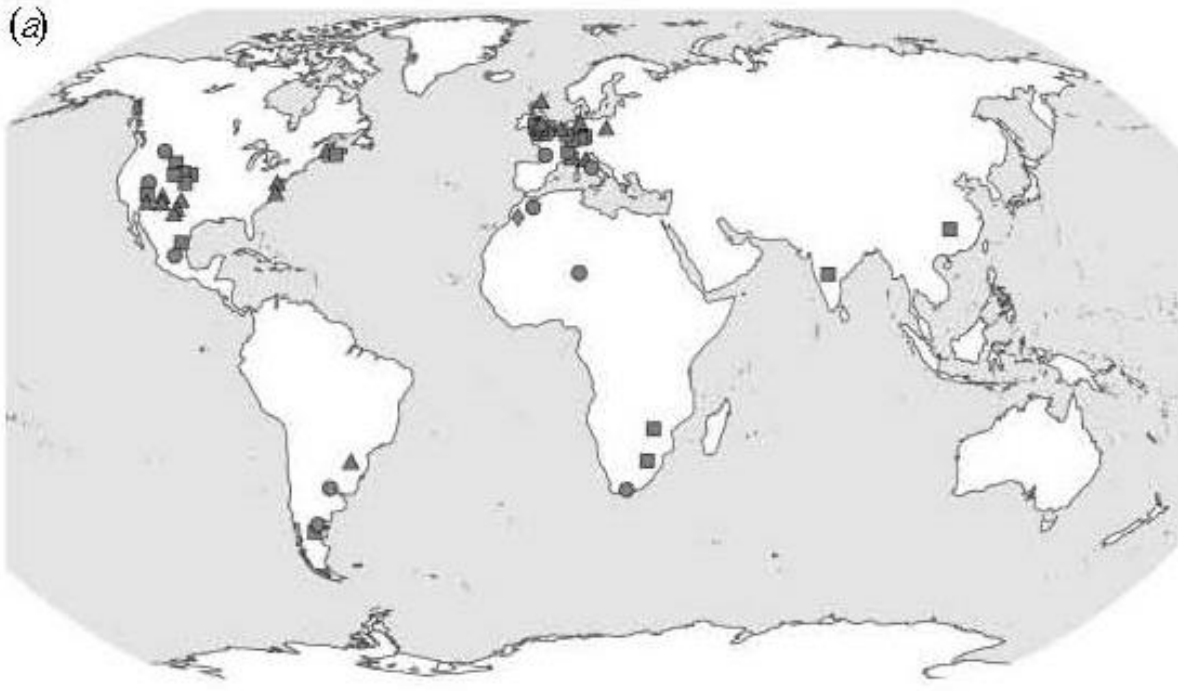
# Lepidosauria (Triássico Sup. - Recente)

## Sphenodontia e Squamata

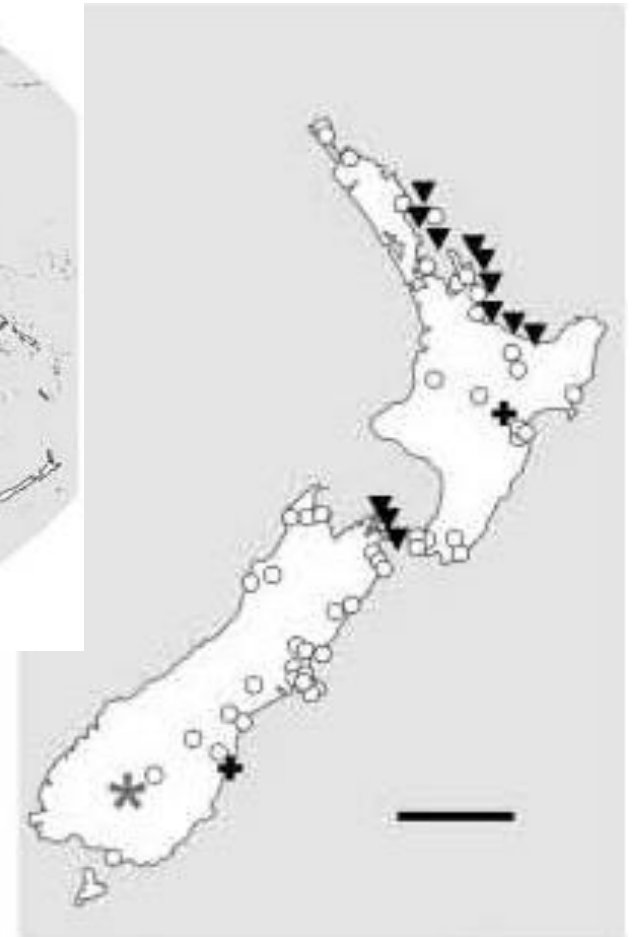


# Sphenodontia (Triássico sup. – Recente)

Mesozóico = cosmopolita; Cenozóico = Nova Zelândia



Triangles, Triassic; squares, Jurassic; filled circles, Cretaceous;



asterisk, Miocene; pluses, Pleistocene; open circles, Holocene; down triangles, extant populations.

## Serpentes (Cretáceo inf. - Recente)

Grande diversificação no Terciário (juntamente com os mamíferos)



*Papaeopyton*, Eoceno, Messel

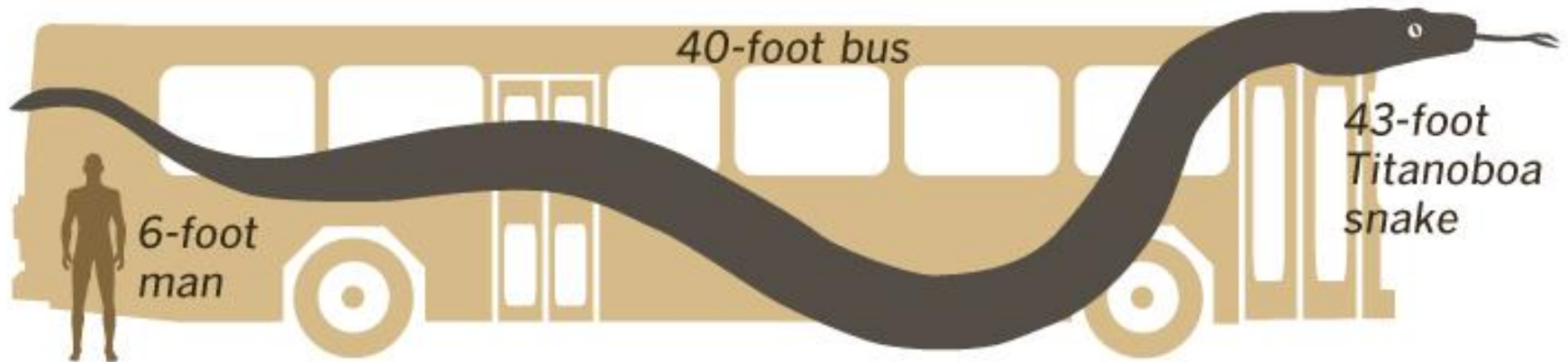
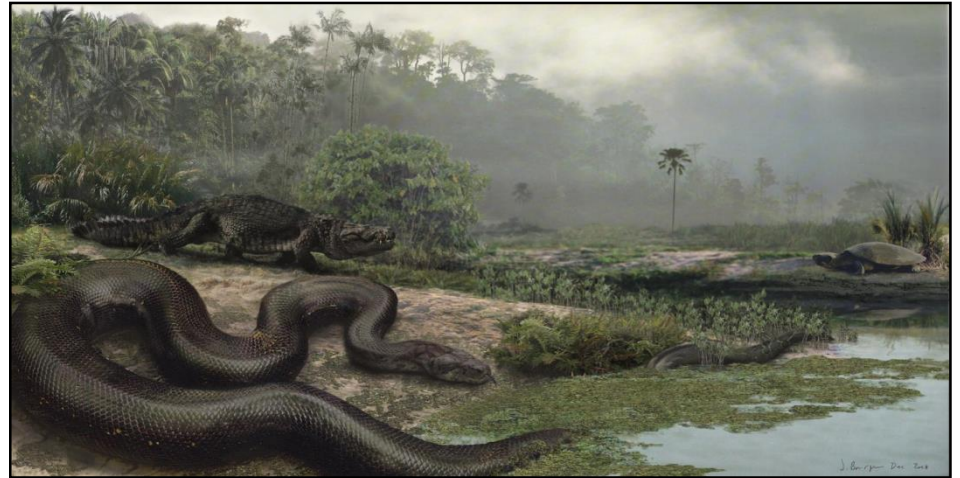
Boiidae, Eoceno, Wyoming



# Serpentes (Cretáceo inf. - Recente)

## *Titanoboa cerrejonensis*

Palaeoceno da Colombia (13 m e mais de 1 ton.)





# Crocodylomorpha (Triássico – Recente)

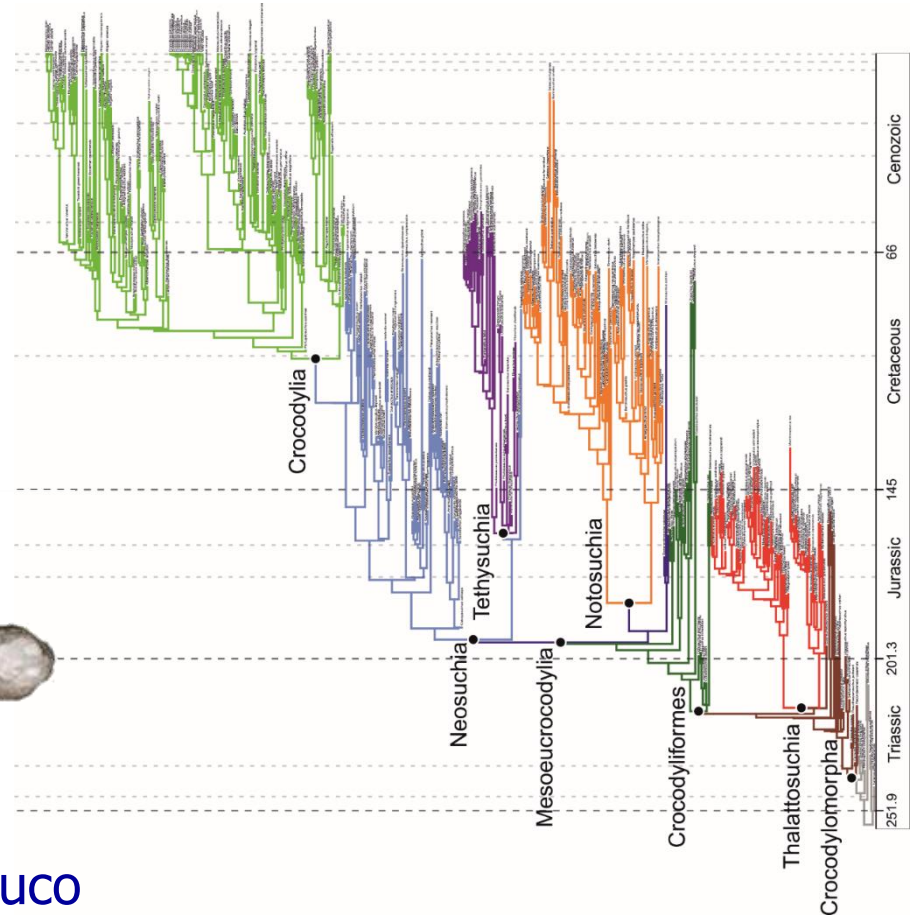
## Crocodylia (Cretáceo – Recente)



*Sebecus*. Eoceno da Argentina



*Guarinisuchus*.  
Paleoceno de Pernambuco



# Paleógeno 66-23 Ma

(Paleoceno-Eoceno-Oligoceno)

Middle Eocene 50.2 Ma

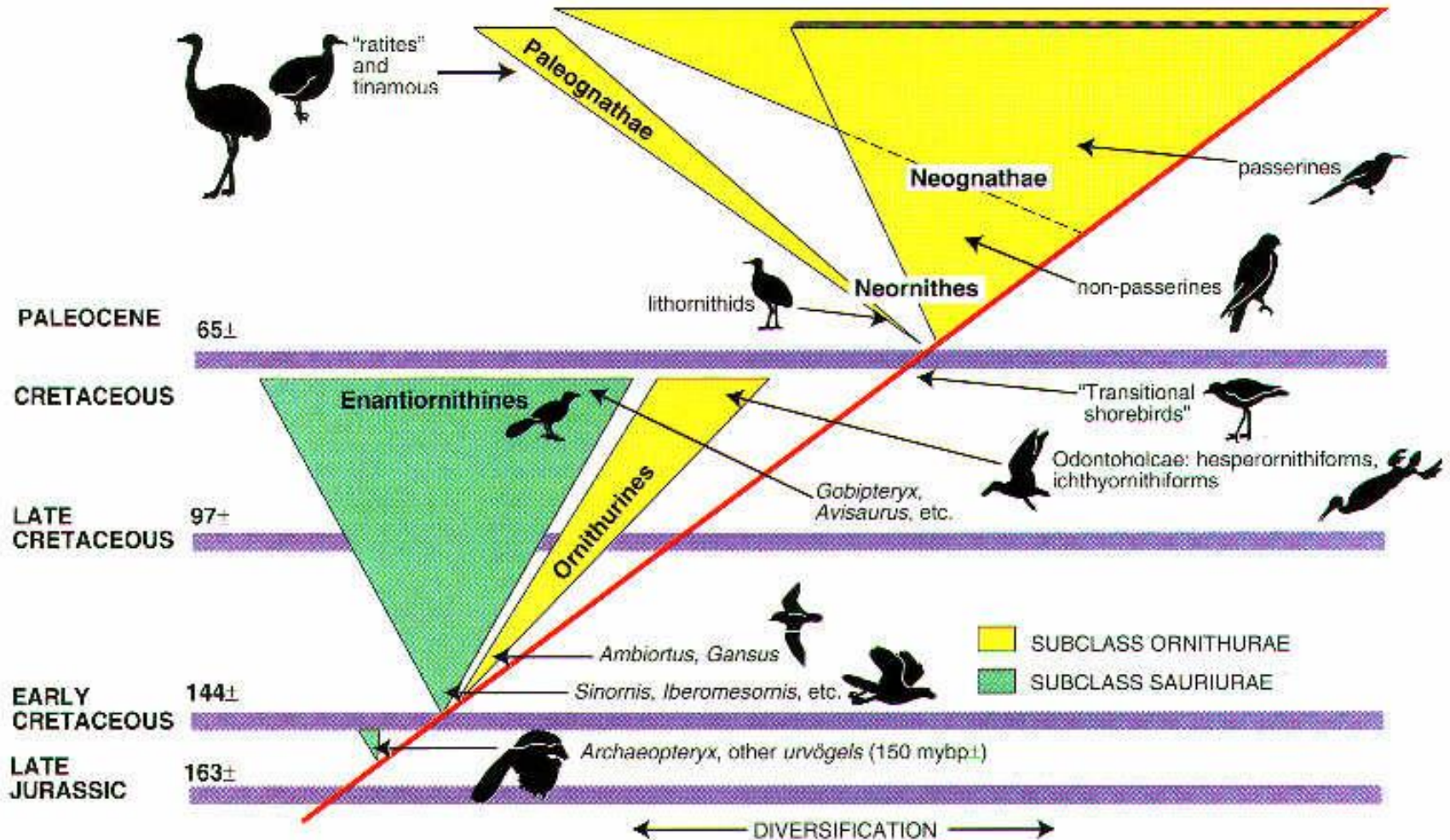


- Ancient Landmass
- Modern Landmass
- Subduction Zone (triangles point in the direction of subduction)
- Sea Floor Spreading Ridge

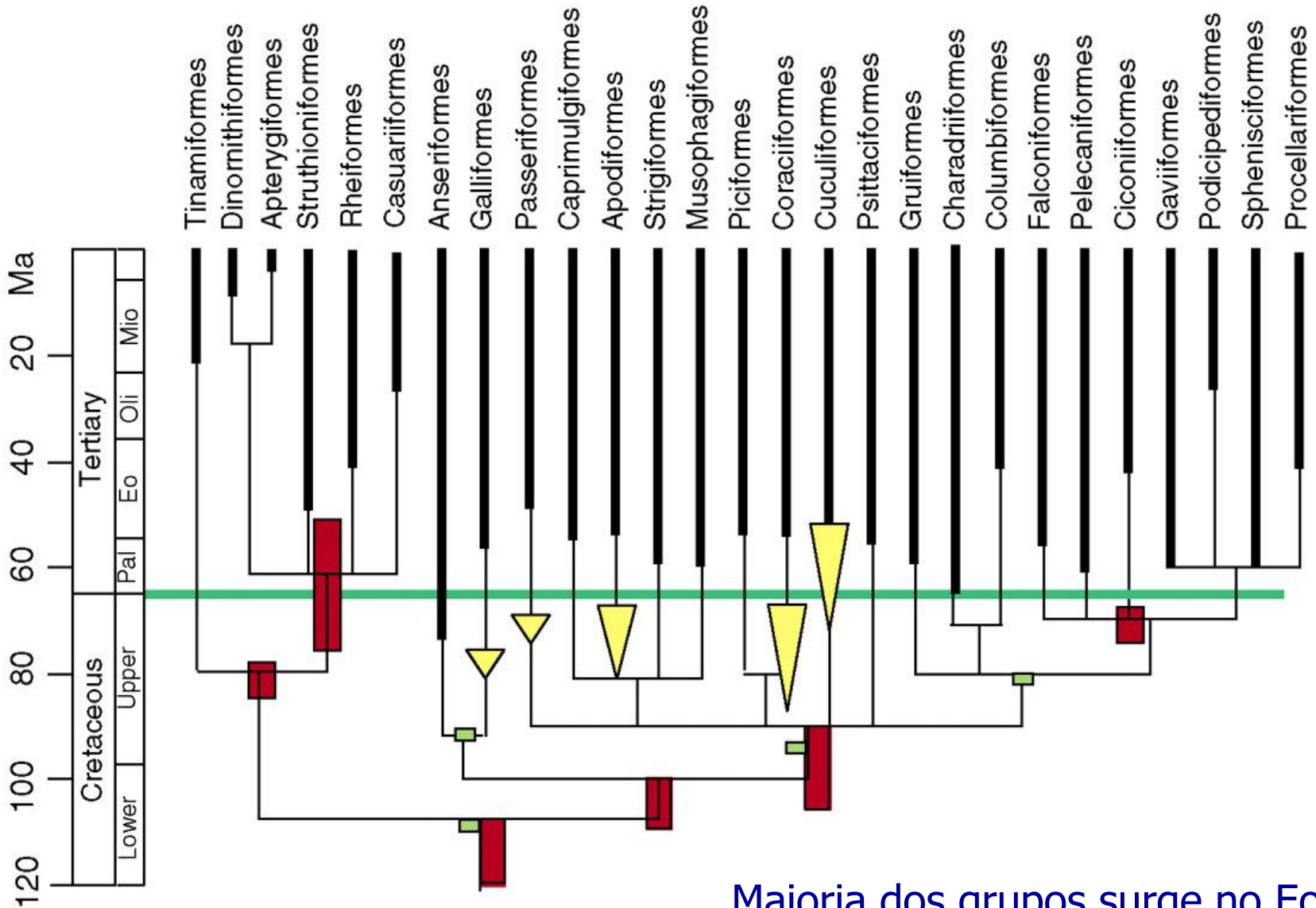
© 1998, C. R. Scotese, Paleogeography

# Aves (Cretáceo sup. - Recente)

## Irradiação após evento K-T



# Aves (Cretáceo sup. - Recente)



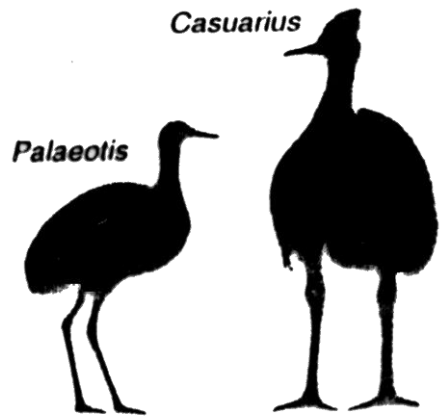
Maioria dos grupos surge no Eoceno  
Divergência com relação aos estudos de relógio-molecular

# Palaeognathae (Paleoceno - Recente)

Ratites (Paleoceno - Recente): *Diogenornis*, forma mais antiga (Itaboraí)

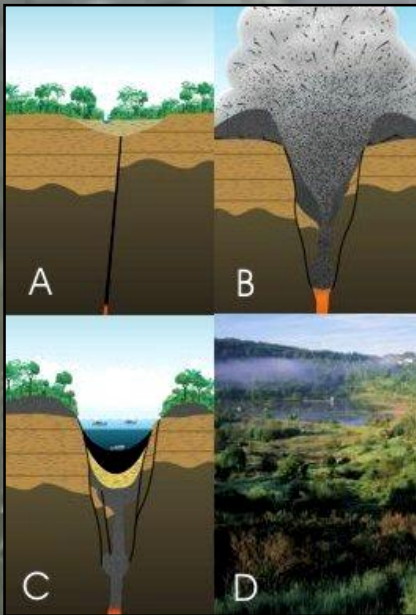


*Palaeotis* (Eoceno da Alemanha)  
forma terrestre pouco menor que uma ema



# Messel Grube (Eoceno da Alemanha)

Lago eutrófico (fundo anóxico) em ambiente florestal formado em sistema de falhas tectônicas



## Caprimulginiformes (Eoceno - Recente)



*Masillapodargus*  
carimulgiforme  
Eoceno de Messel

## Trochiliformes (Pleistoceno - Recente)



*Eurotrochilus*  
Oligoceno da Europa



# **Colliformes** (Eoceno - Recente), mais abundantes no Terciário



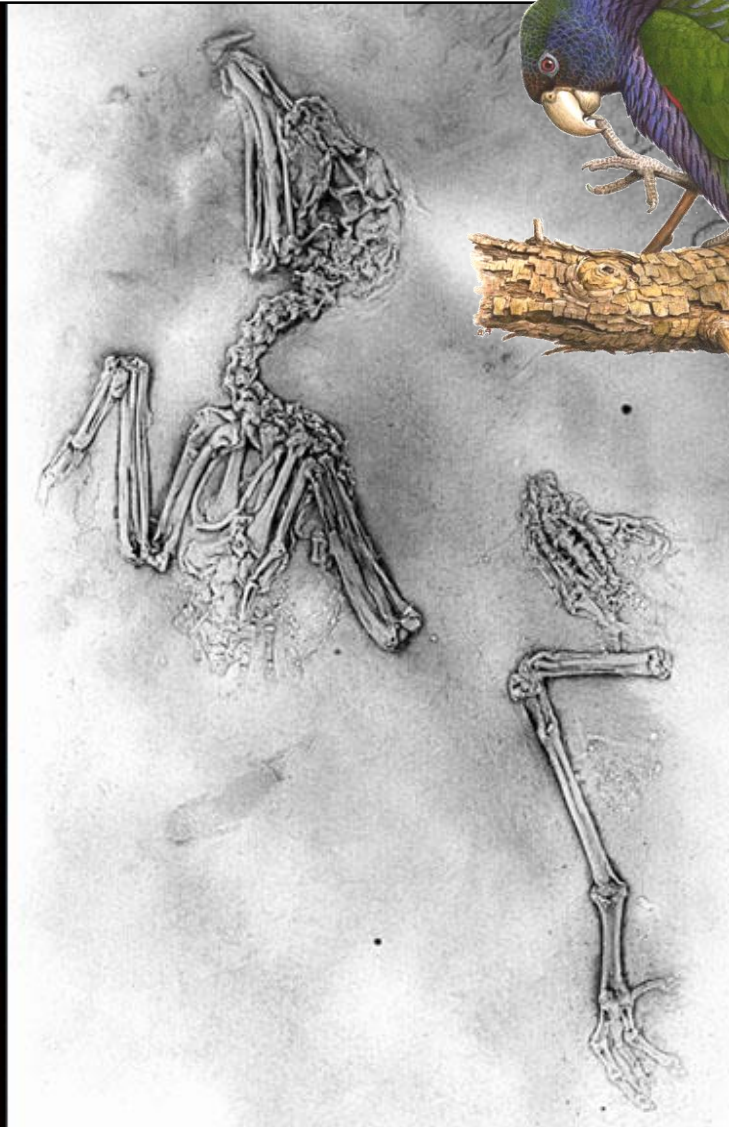
Atualmente restritos à África

*Eoglaucidium*  
Eoceno de Messel



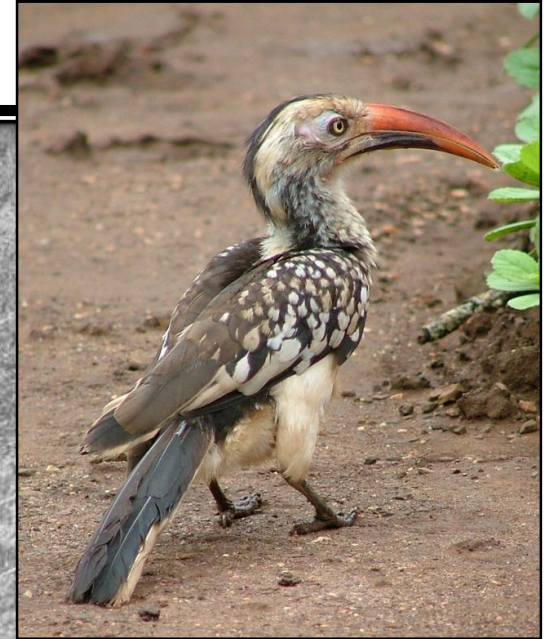
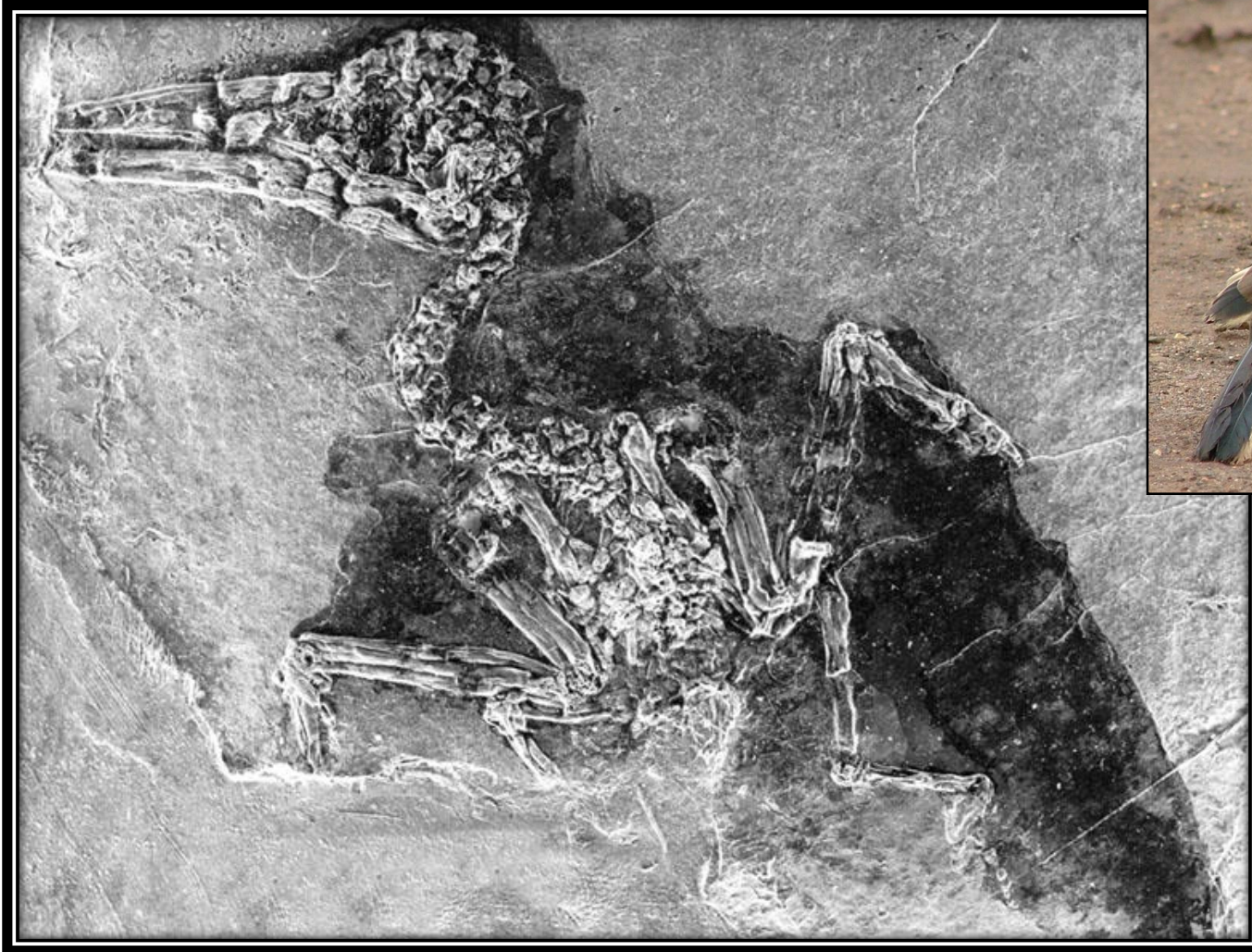
# Psittaciformes (Eoceno - Recente)

*Psittacopes*: "papagaio" do Eoceno de Messel



# Coraciformes - Grupo provavelmente parafilético

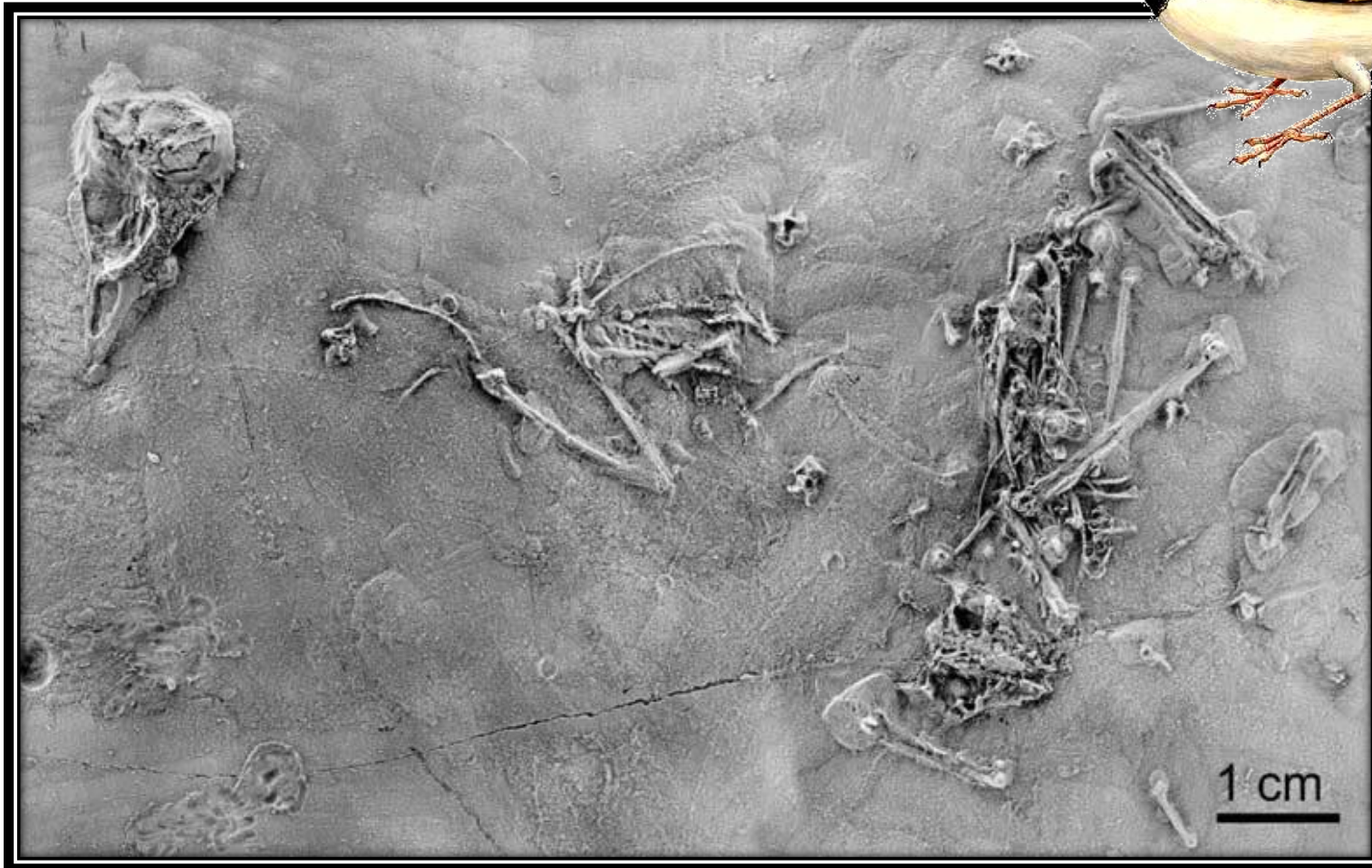
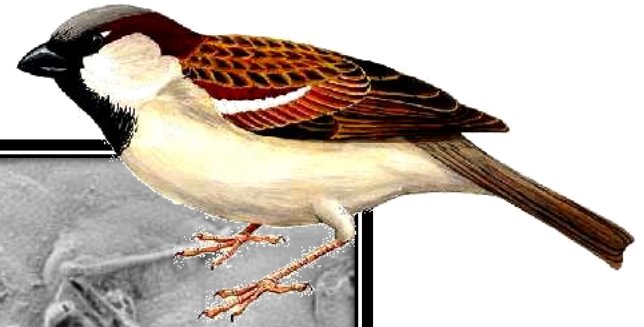
Alcedinidae, Bucerotidae, Trogonidae



*Messelirrisor*  
"calau"  
Eoceno de Messel

**Passeriformes** (Oligoceno - Recente), possíveis registros no Eoceno da Austrália, tornam-se abundantes no Mioceno

Passeriforme do Oligoceno  
Frauemnweiler (Alemanha)



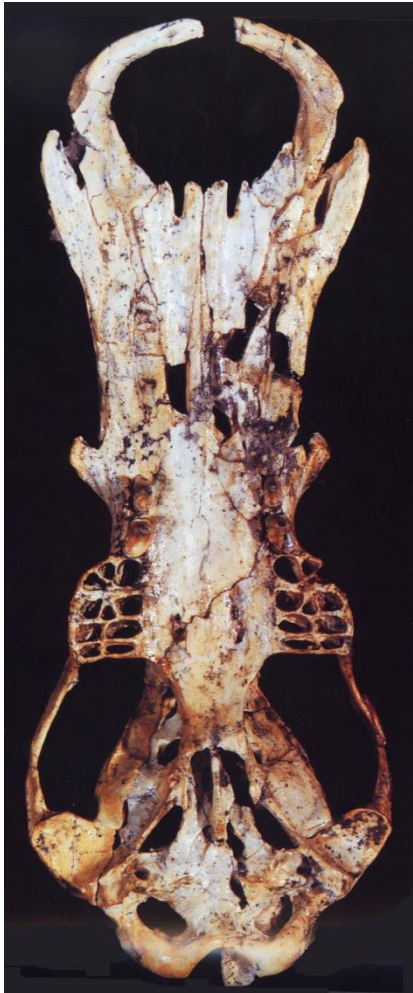
# **Galloanserae** - Gastornithiformes (Paleoceno-Eoceno)

*Diatryma* (Paleoceno-Eoceno da Europa e EUA)



# Monotremata (Cretáceo inf. - Recente)

Formas afins ao *Ornithorhynchus* no Paleoceno da Argentina e à partir do Mioceno na Austrália



*Obdurodon*  
(Mioceno)

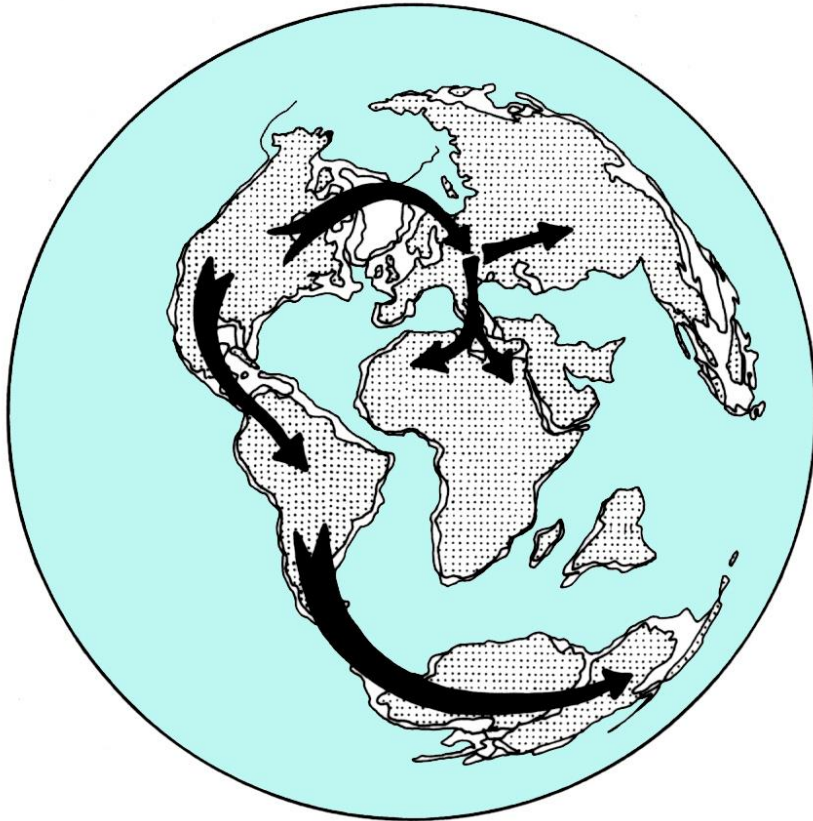


*Monotrematum sudamericanum*



## **Metatheria** (Cretáceo inf. – Recente)

Da América do Norte, dispersão formas basais para América do Sul (ainda no Cretáceo, possível registro no Peru) e no Paleoceno para Europa e África, mas todos se extinguiram no Mioceno destes continentes

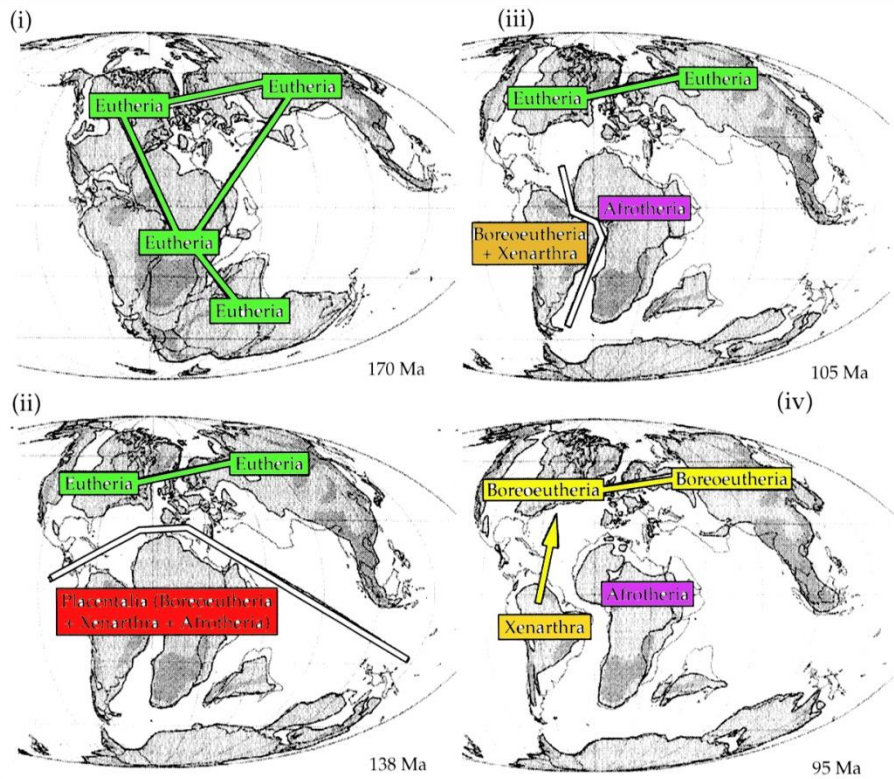
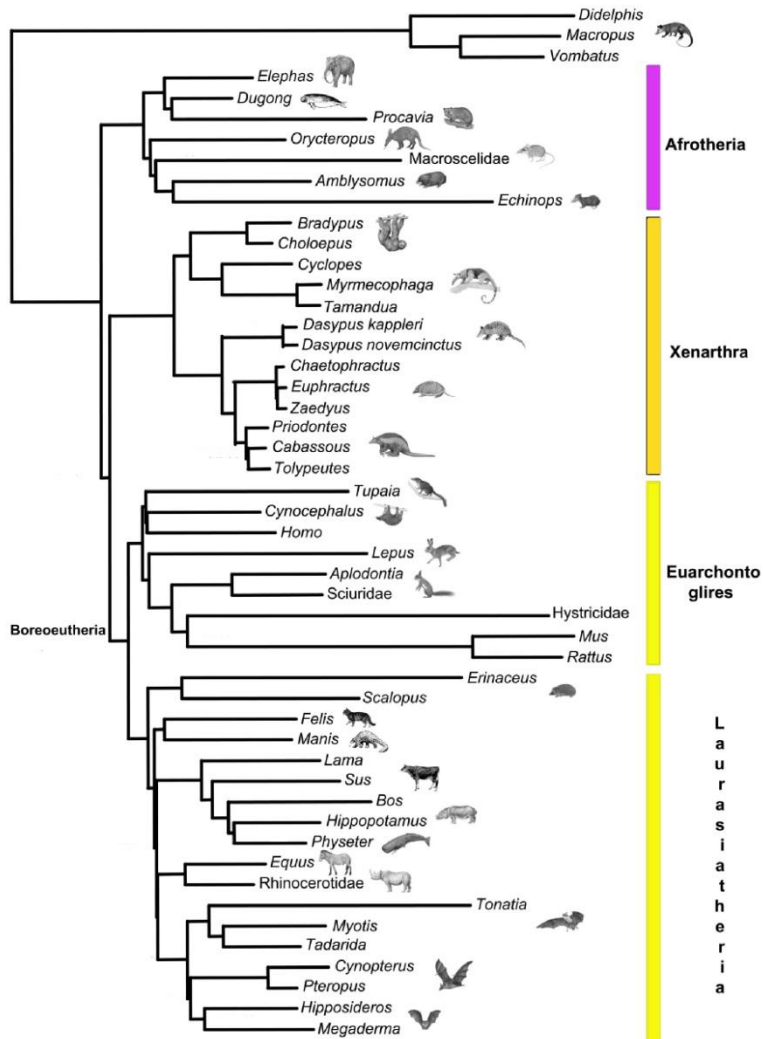


*Pucadelphys*  
(Paleoceno da Bolívia)

# Eutheria (Cretáceo inf. - Recente)

Três grandes grupos: Afrotheria, Xenarthra e Boreoeutheria

(= Laurasiatheria + Euarchontoglires)



Vicariantes pela separação das massas de terra no Cretáceo

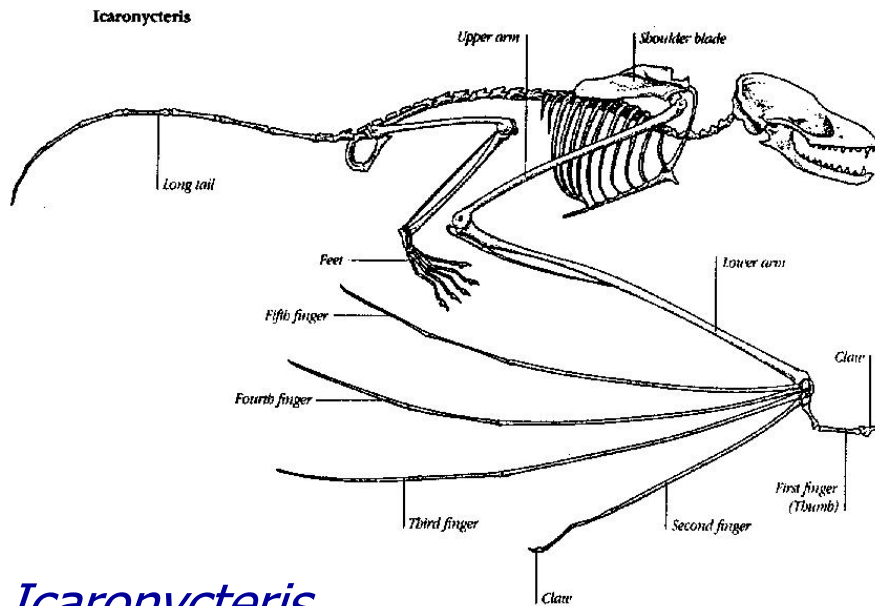


# Chiroptera (Eoceno - Recente)

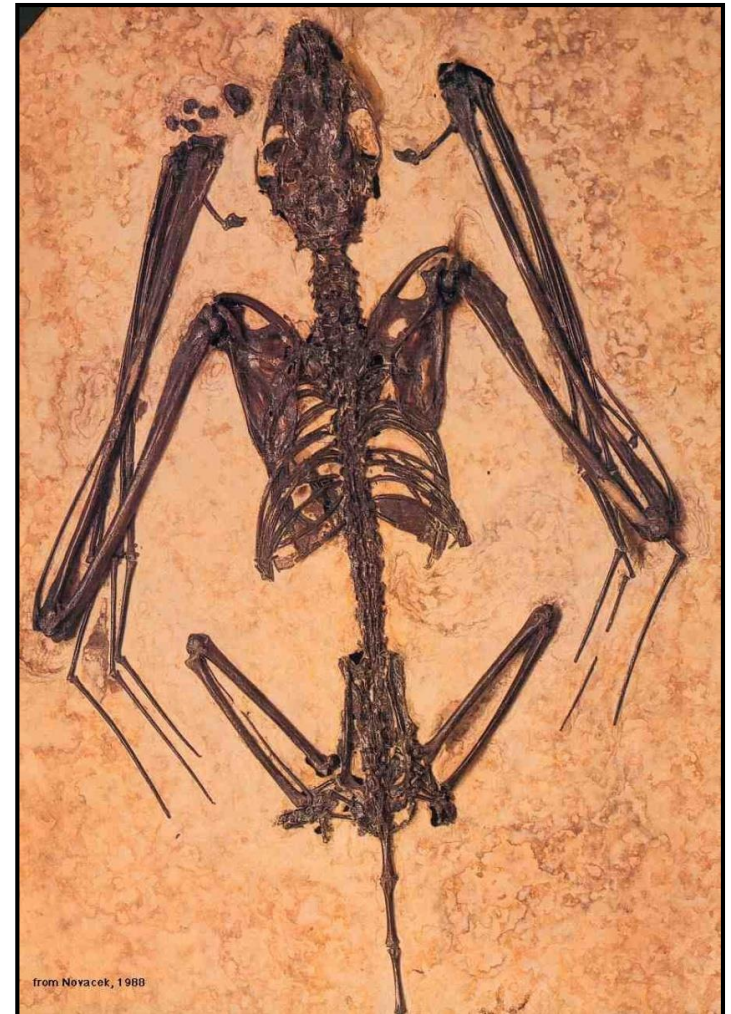
Possível registro no Paleoceno da Europa

Distribuição global já no Eoceno (incluindo Austrália)

Bastante modificado desde o início:  
falanges alongadas, pernas robustas e  
órbitas grandes



*Icaronycteris*  
(Green River Fm., Eoceno de Wyoming)

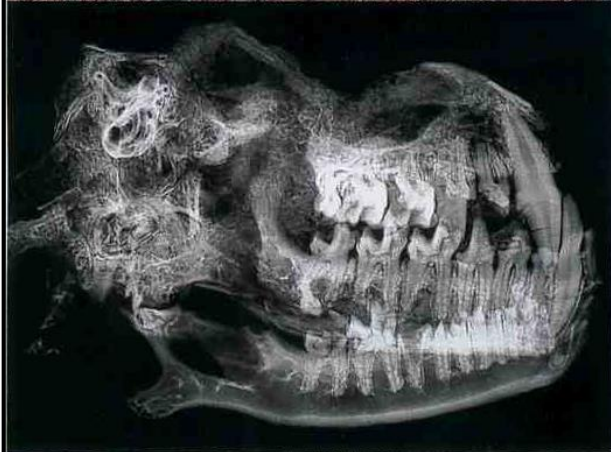


# Chiroptera (Eoceno - Recente)

Formas do Eoceno de Messel possuem características de Microchiroptera



*Hassianycteris* com cóclea bem desenvolvida (ecolocalização)



SKULL, 1 IN LONG. SENCKENBERG, JÖRG HABERSETZER. SCALES, GOTTHARD RICHTER AND SVEN BASZIL



*Palaeochiropteryx* com escamas de mariposa no conteúdo estomacal

# Rodentia (Cretáceo?, Paleoceno – Recente)

*Eomys*: um dos primeiros Miacidae (ratos e hamsters)

Planador do Eoceno de Quercy



# **Rodentia** (Cretáceo?, Paleoceno – Recente)

*Eomys*: um dos primeiros Miacidae (ratos e hamsters)

Planador do Eoceno de Quercy



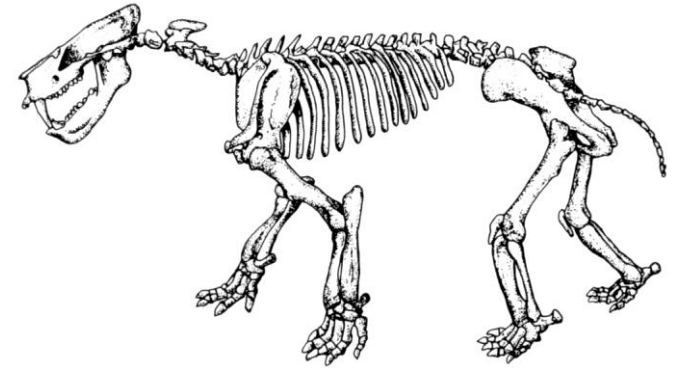
# “Ungulados” basais

Comuns no Paleogeno da Eurásia e América do Norte

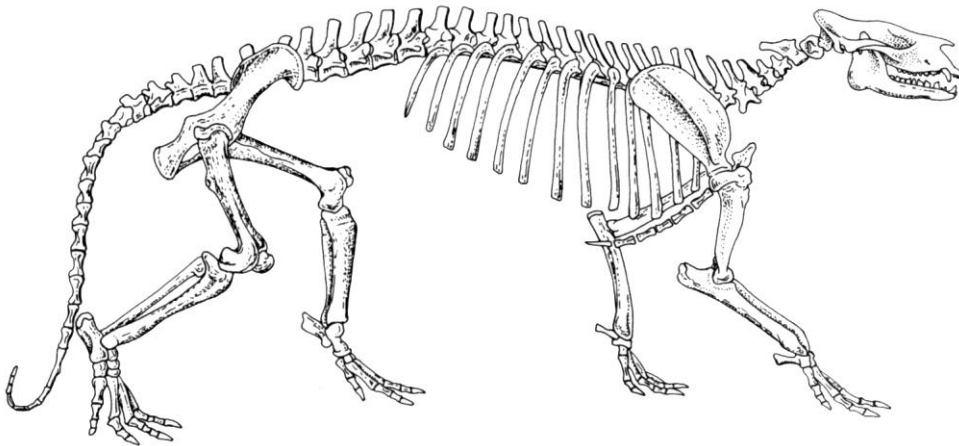
Em geral herbívoros ou onívoros



*Phenacodus*: condilartro Paleoceno dos EUA



*Titanoides*: pantodonte do Paleoceno dos EUA



# “Ungulados” basais



*Kopidodon*: arctocionídeo do Eoceno de Messel

# “Ungulados” basais

Dinocerata (Paleoceno-Eoceno da América do Norte e Ásia)

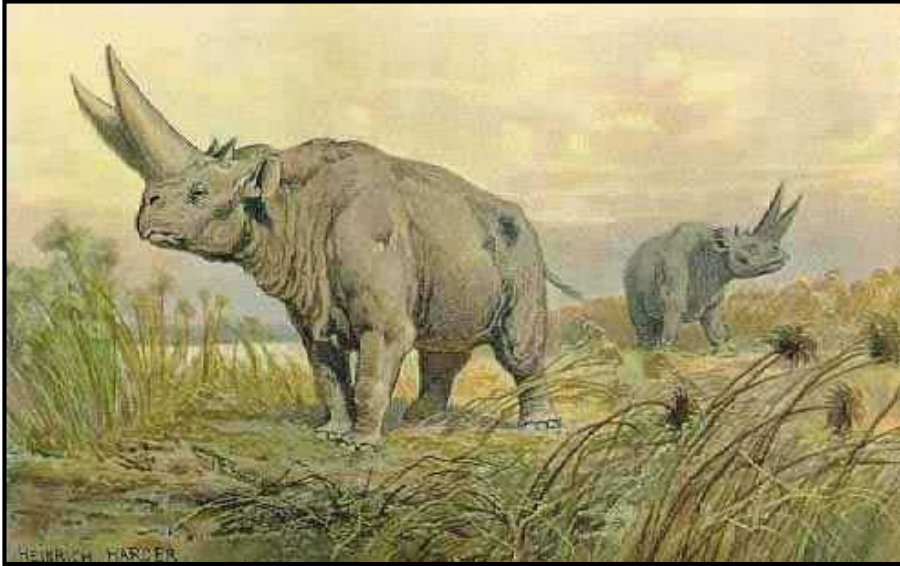
Herbívoros de grande porte: *Uintatherium*

Tamanho de um rinoceronte e crânio com protuberâncias



# Afrotheria (Eoceno-Recente)

Embrithopoda (Eoceno): grupo irmão de Proboscidea



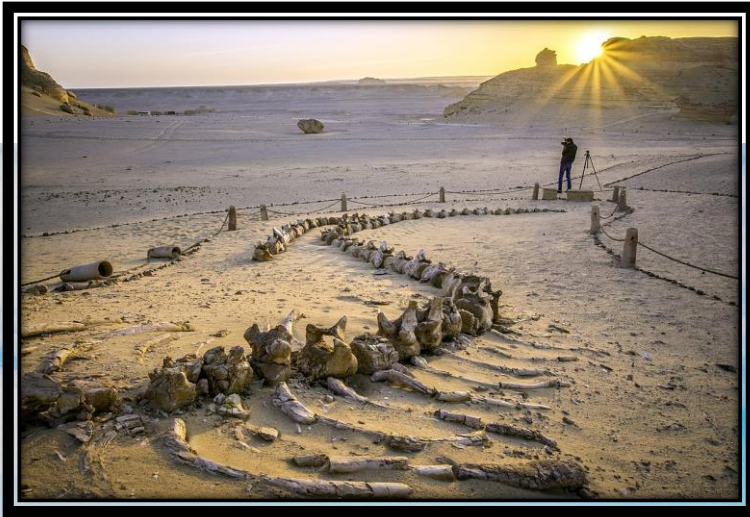
*Arsinoitherium*  
Eoceno de Fayum  
Egito

Registros no norte  
da África, Europa  
e Oriente Próximo





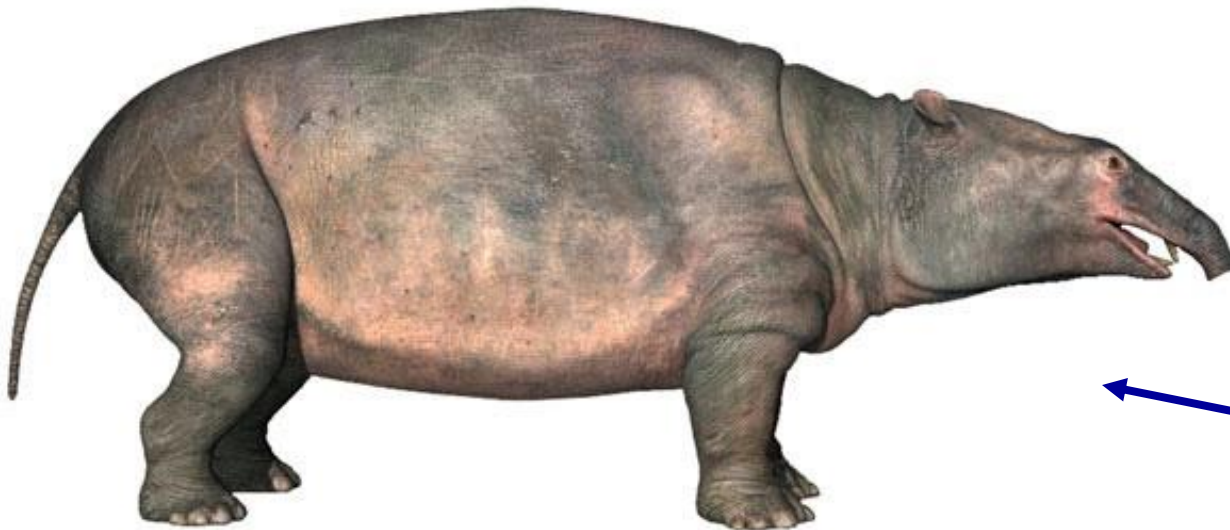
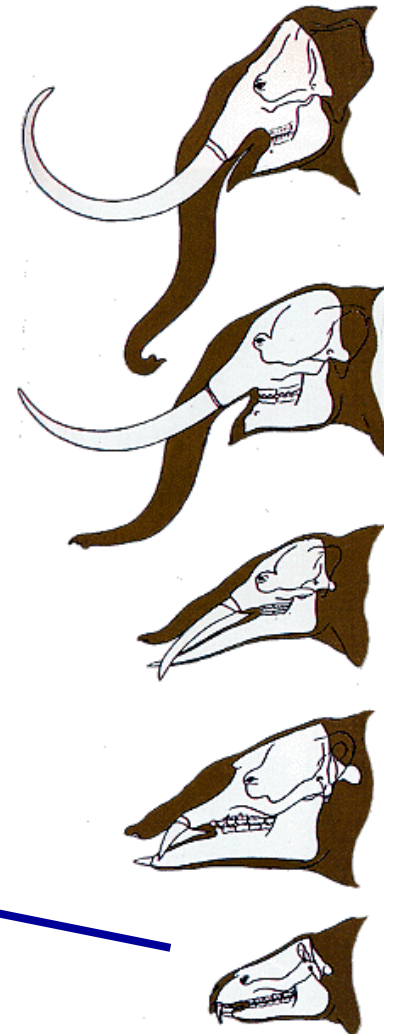
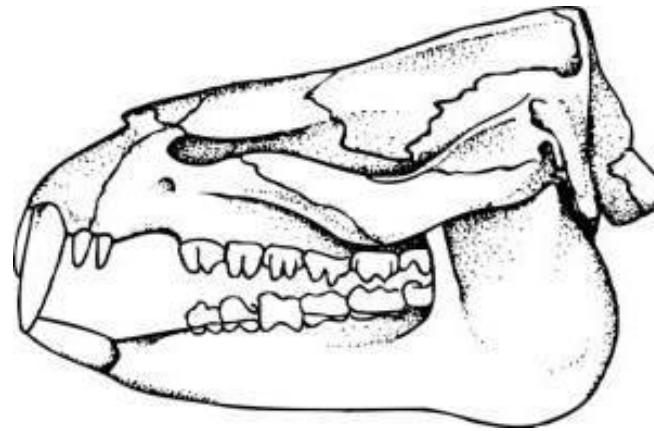
# Depressão de Fayum



# Proboscidea (Paleoceno – Recente)

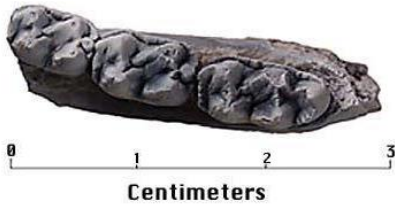
Formas de grande porte, com grande segundo incisivo superior

*Moeritherium* de Fayum: forma semi-aquática tamanho de um hipopótamo

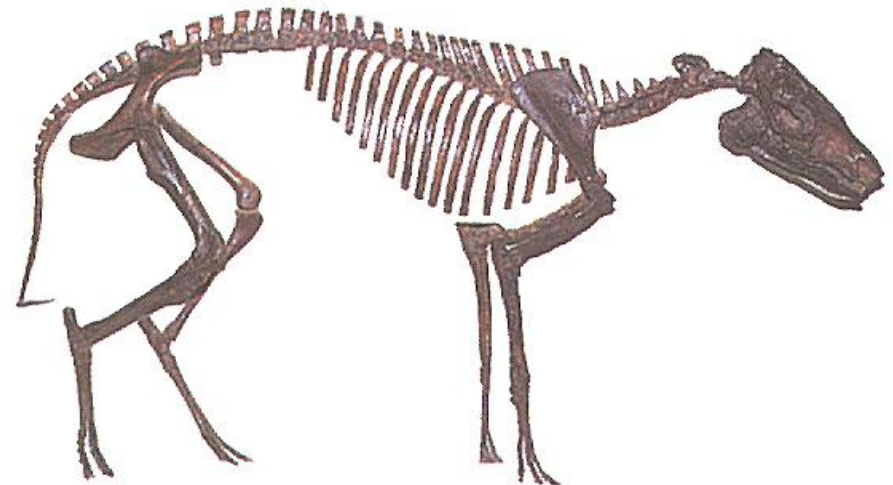
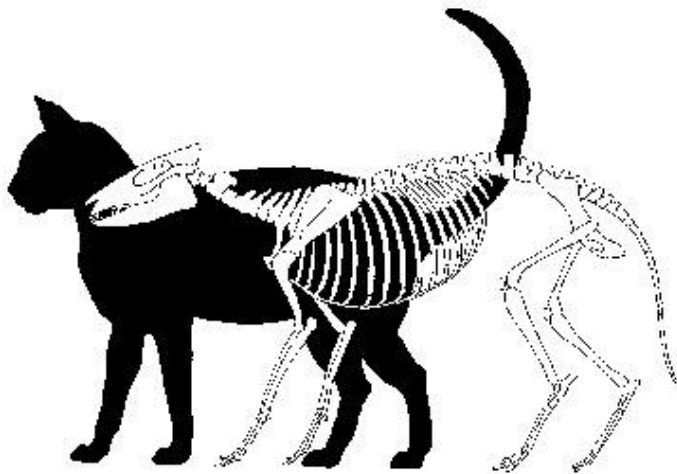


# Perissodactyla (Eoceno – Recente)

Equidae (Eoceno – Recente): folhívoros florestais do Eoceno-Oligoceno



*Hyracotherium* (Eoceno)  
Europa e América do Norte

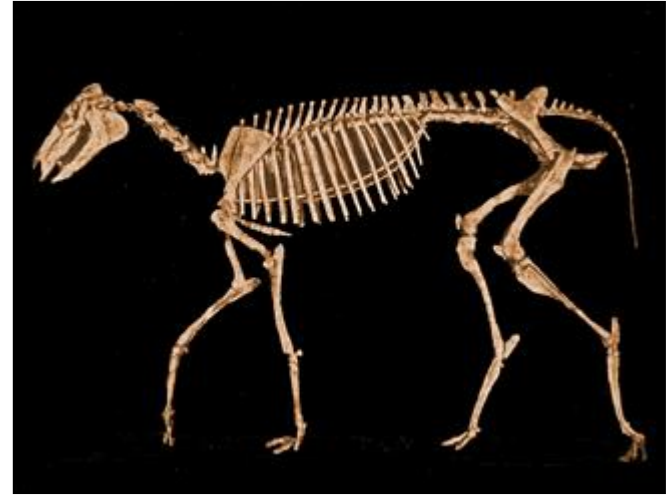


# **Perissodactyla** (Eoceno – Recente)

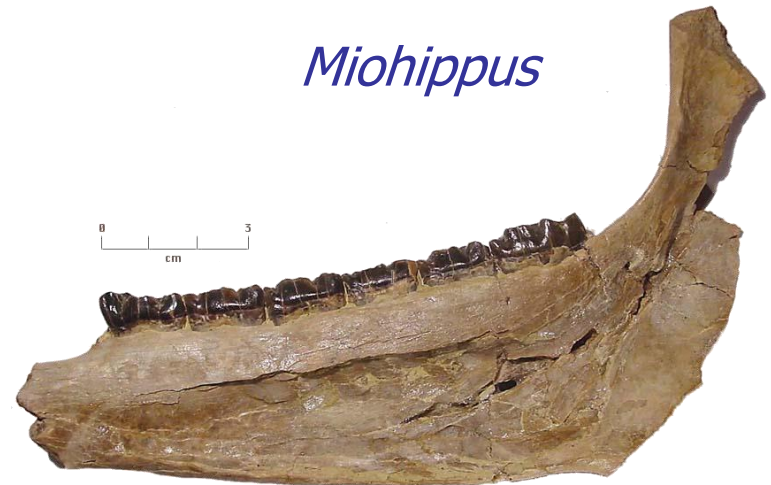
Equidae (Eoceno – Recente): folhívoros florestais do Oligoceno da Europa e América do Norte



*Meshippus*



*Miohippus*



# Perissodactyla (Eoceno – Recente)

Rhinocerotidae (Eoceno – Recente)

Grande variedade no Oligo-Mioceno da Ásia inclui maior mamífero terrestre



*Paraceratherium* (6 m e 30 ton)

(*Indricotherium*, *Baluchiterium*)

High browser Oligoceno do Baluquistão

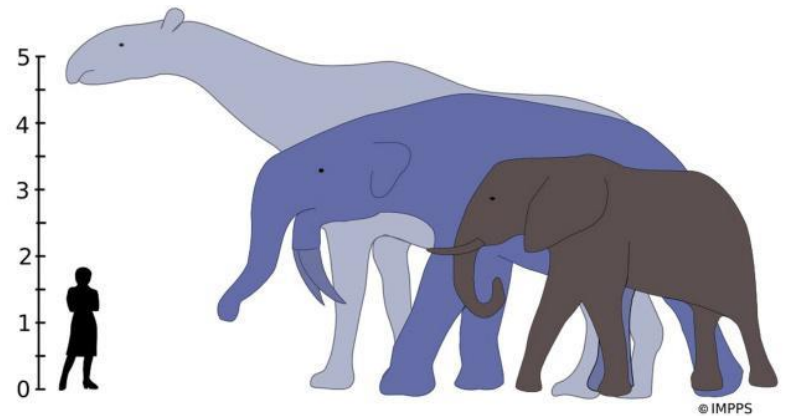


The complete skull of the giant Baluchitherium.

# Perissodactyla (Eoceno – Recente)

Rhinocerotidae (Eoceno – Recente)

*Paraceratherium* (*Indricotherium*, *Baluchiterium*)

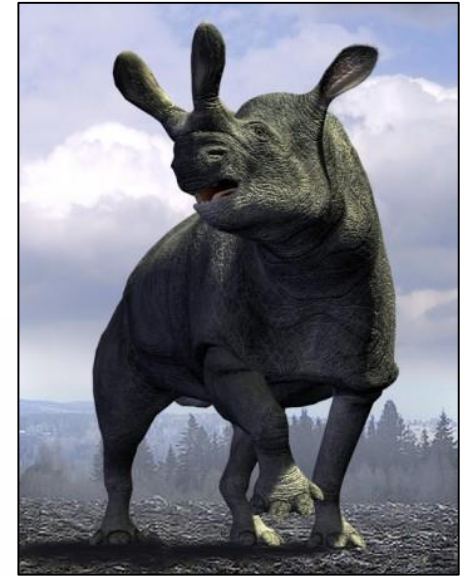
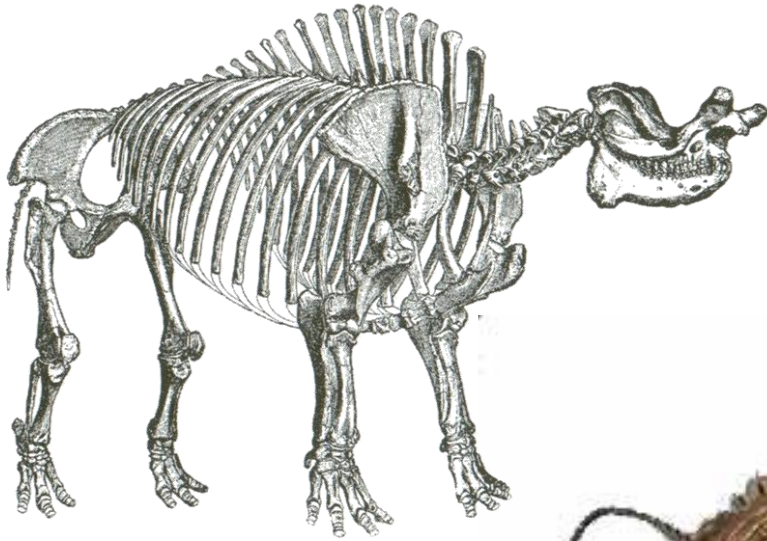


# Perissodactyla (Eoceno – Recente)

Brontotheridae (Eoceno – Oligoceno)

Irmão dos demais Perissodactyla - Abundantes na América do Norte e Eurásia

Grande porte (até 2.5 m) crânios com cornos de diversas morfologias



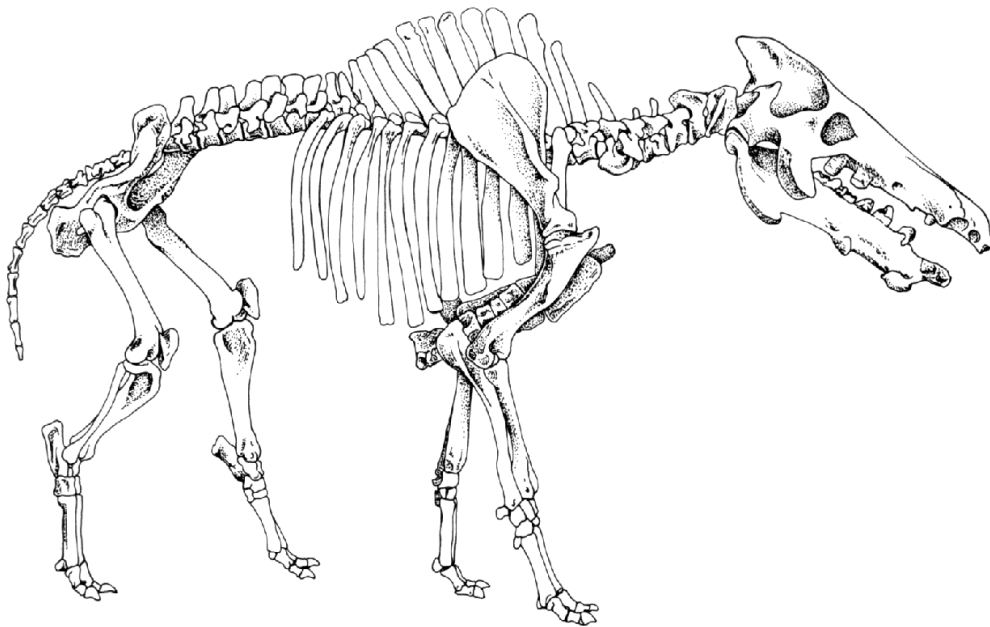
*Brontotherium:*  
Oligoceno dos EUA



# **Artiodactyla** (Eoceno – Recente)

“Bunodontia” (Eoceno – Recente): formas basais

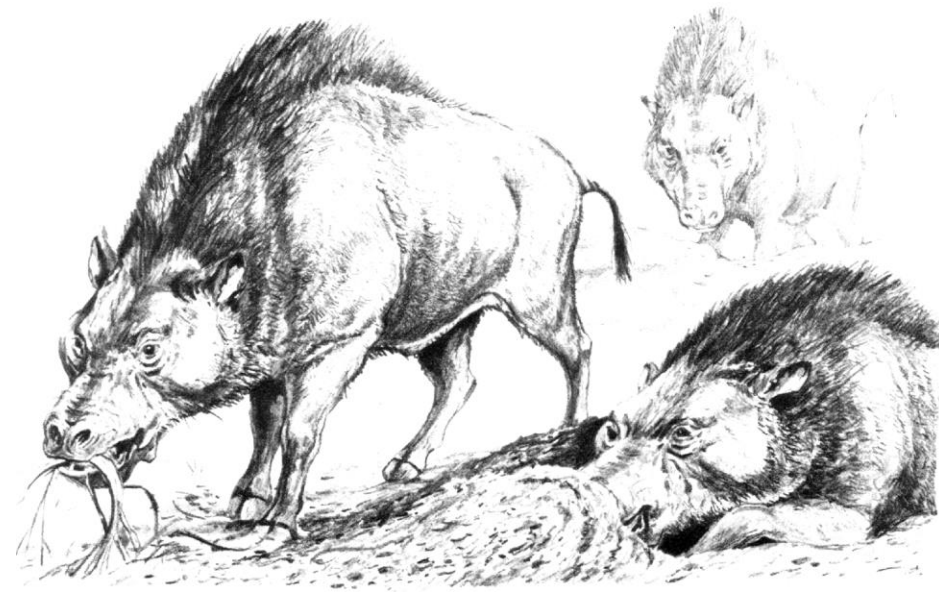
Onívoros de grande porte



*Entelodon*  
Oligoceno da Europa



*Dinohyus* (Entelodontidae)  
Mioceno da América do Norte

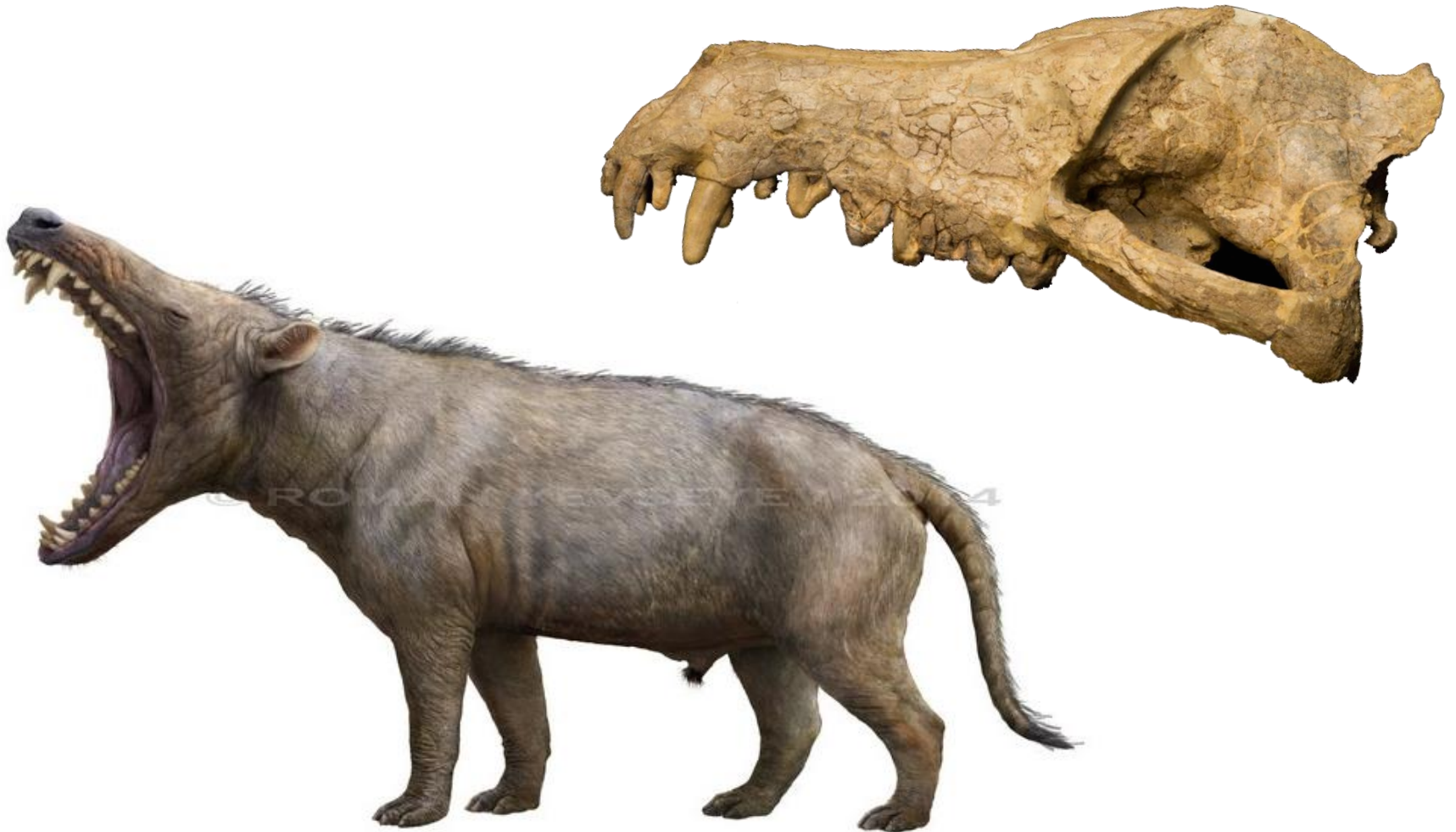




## **Artiodactyla** (Eoceno – Recente)

“Bunodontia” (Eoceno – Recente): formas basais

*Andrewsarchus*: Eoceno da Mongólia

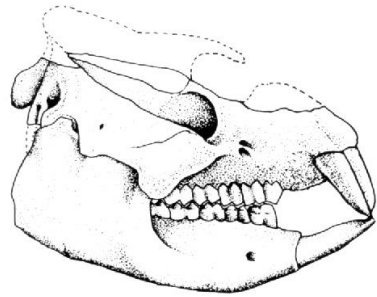


## **Meridiungulata** (Paleoceno - Recente)

Pyrotheria (Eoceno – Oligoceno): talvez afim à Dinocerata e Astrapotheria

Incisivos alongados e possível probóscide - pós-crânio desconhecido

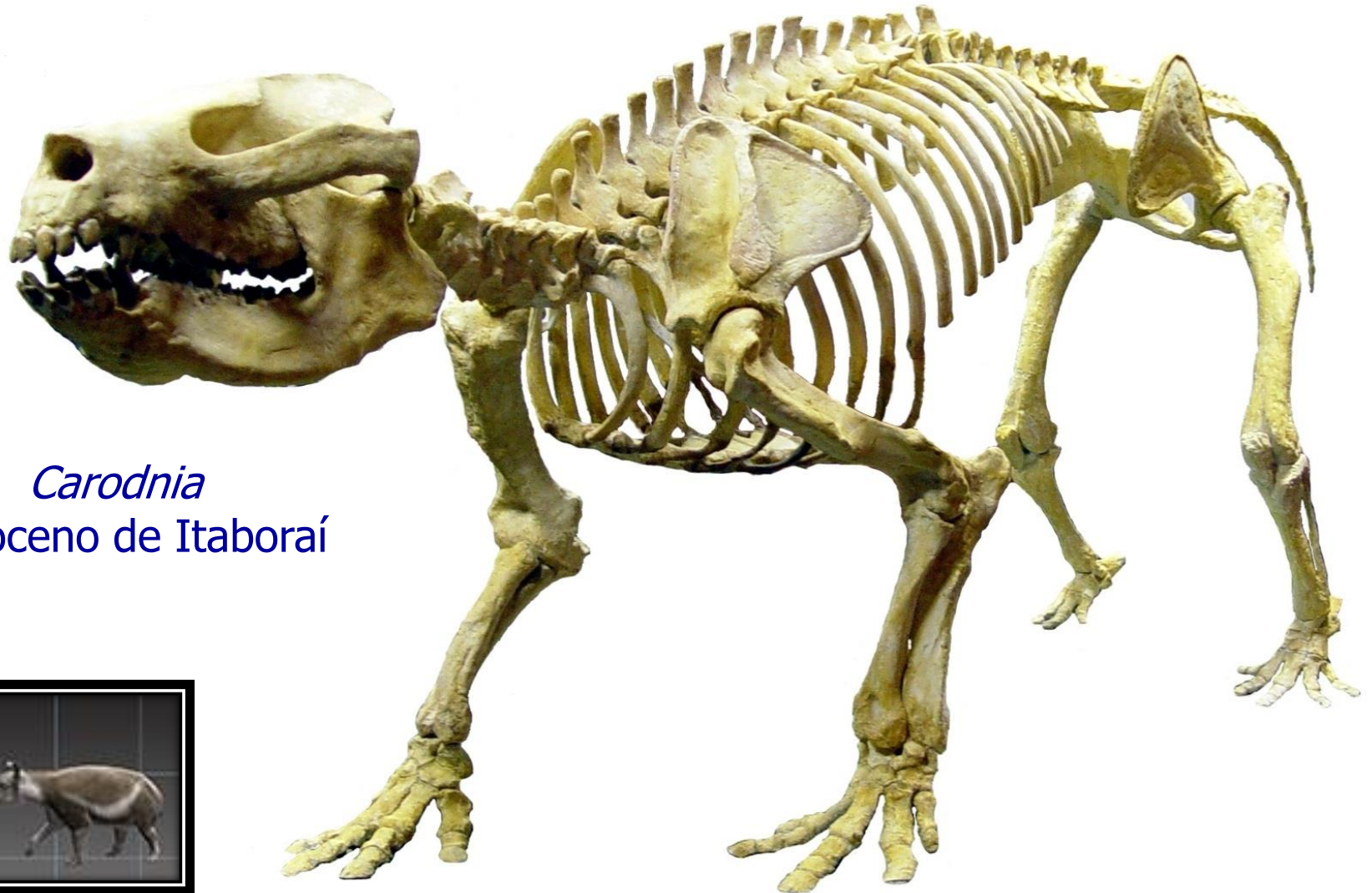
No Brasil: possível registro no Oligo-Mioceno do Acre



*Pyrotherium*  
Oligoceno da Patagonia

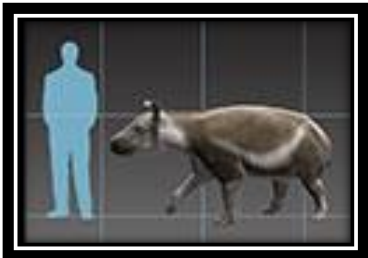
# Meridiungulata (Paleoceno - Recente)

Pyrotheria (Eoceno – Oligoceno): pode incluir Xenungulata



*Carodnia*

Paleoceno de Itaboraí



# Itaboraí (Paleoceno do RJ)



Parque Paleontológico de  
São José de Itaboraí  
O berço dos mamíferos



60 Milhões de Anos

Projeto Caminhos Geológicos



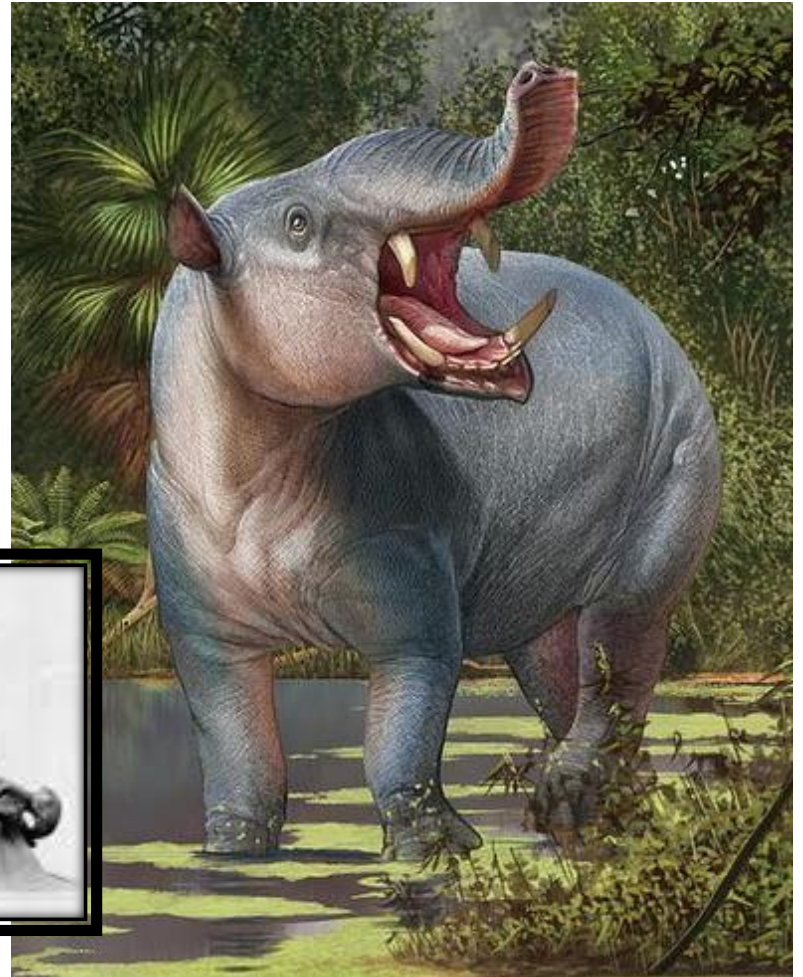
## Meridiungulata (Paleoceno - Recente)

Astrapotheria (Paleoceno – Mioceno): talvez afim à Dinocerata e Pyrotheria

Incisivos inferiores e caninos superiores alongado - No Brasil: *Tetragonostylops* (Paleoceno de Itaboraí) e formas gigantescas no Oligo-Mioceno do Acre



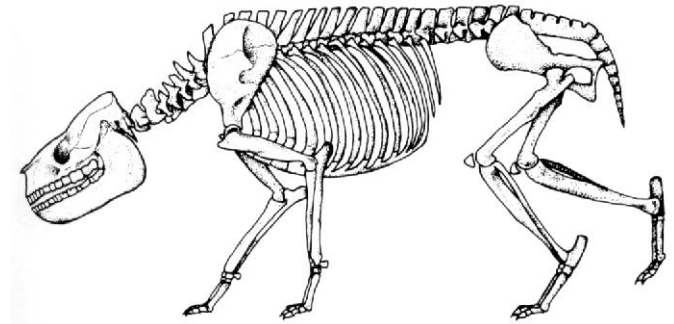
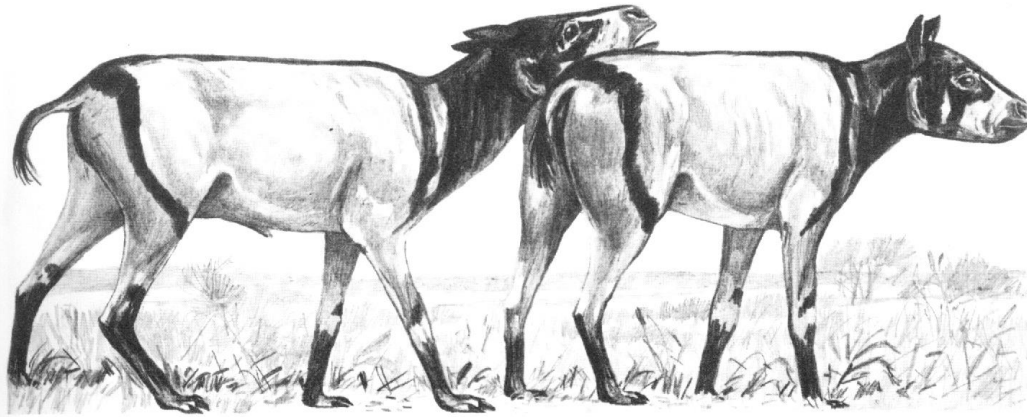
*Astraptherium*  
Oligoceno da  
Patagonia



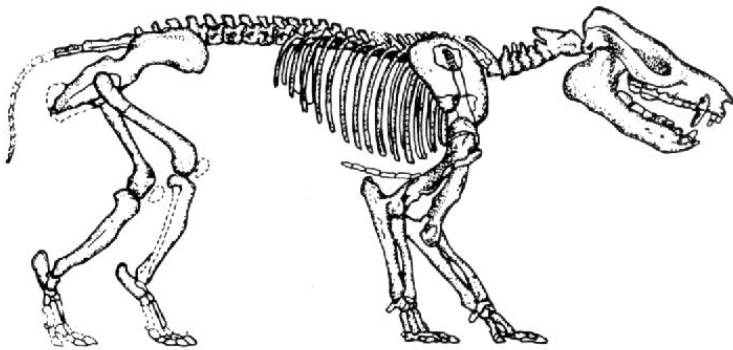
# Meridiungulata (Paleoceno - Recente)

Notoungulata (Paleoceno – Pleistoceno)

Toxodonta: inclui formas de médio à grande porte



*Rhynchippus*: forma herbívora  
Eoceno da Patagonia



*Thomashuxleya*: forma onívora  
do Eoceno da Patagonia

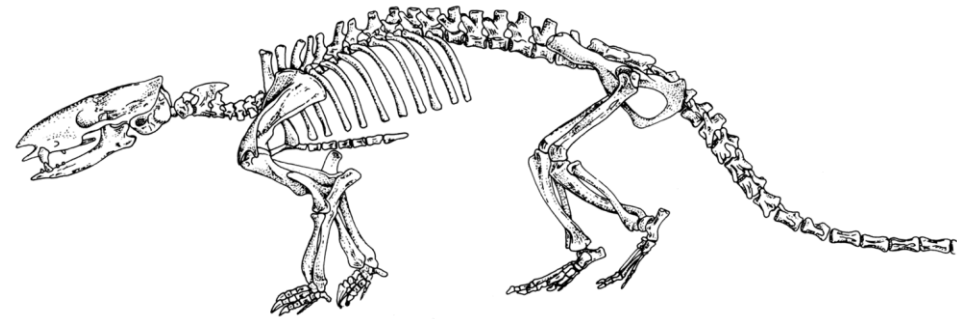


## **Palaeanodonta** (Paleoceno-Oligoceno):

Formas cavadoras possivelmente afins aos Pholidota

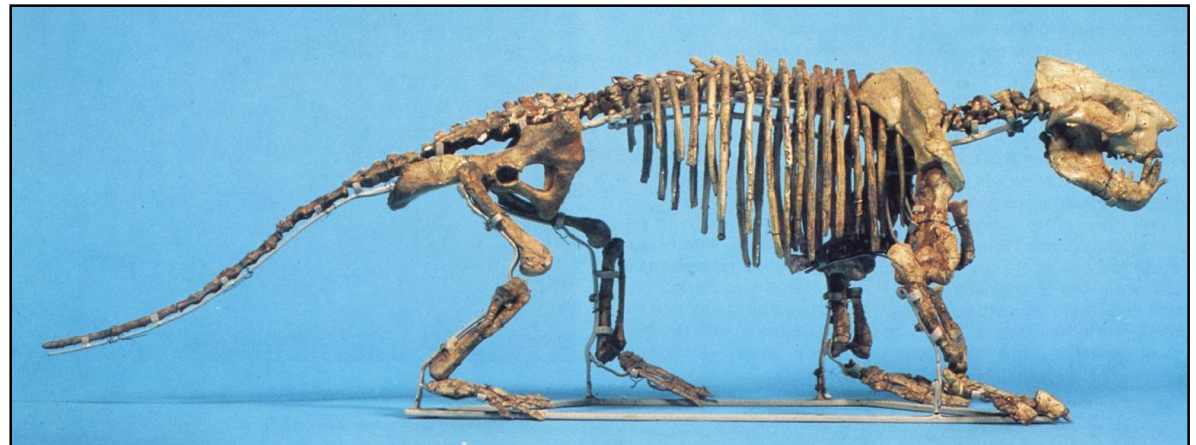
Com redução dentária menos marcada (carnívoros?) e hábito cavador

*Escavadodon*  
Paleoceno dos EUA

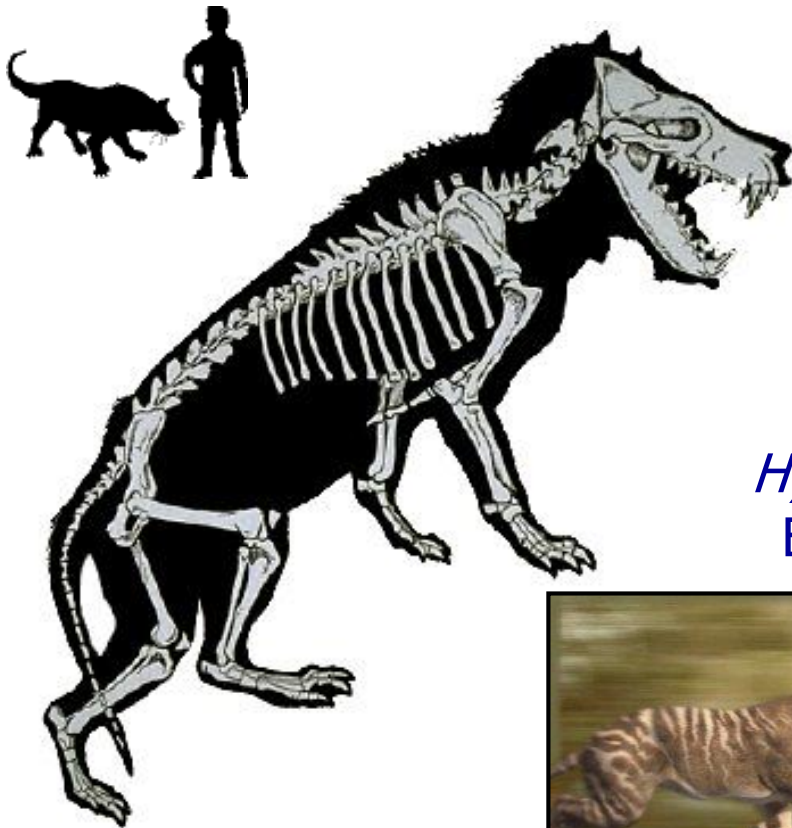


*Metacheiromys*  
Eoceno dos EUA

*Ernanodon*  
Paleoceno da China



**Creodonta** (Paleoceno - Mioceno):  
forma Ferae juntamente com Carnivora  
Presença de dentes carniceiros



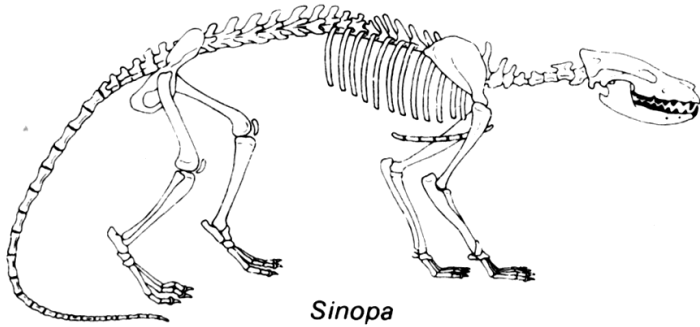
*Hyaenodon* (Eoceno-Oligoceno  
Eurásia e América do Norte)





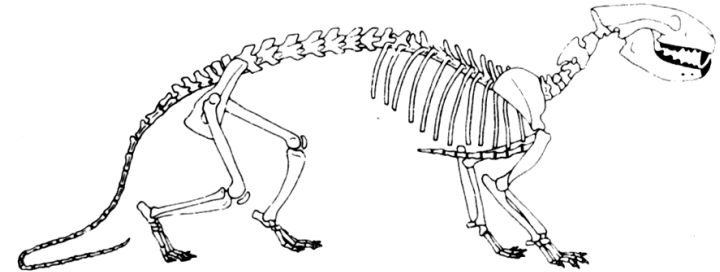
# Creodonta (Paleoceno - Mioceno):

Grupo possivelmente polifilético com morfologias convergentes à Carnívora



*Sinopa*

*Sinopa* (Eoceno, Ásia)



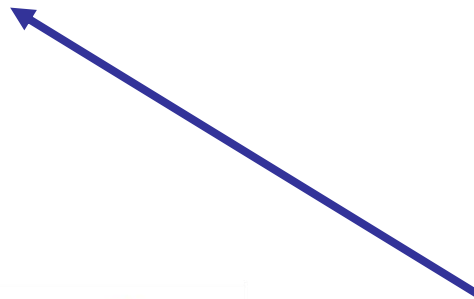
*Oxyaena*

*Oxyaena* (Paleoceno-Eoceno  
América do Norte e Ásia)



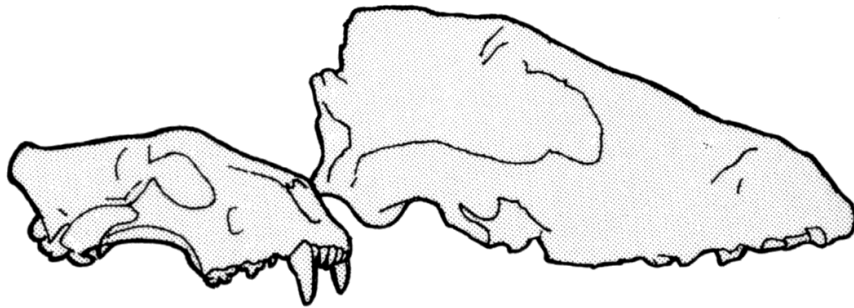
*Patriofelis*

*Patriofelis* (Eoceno, América do Norte)

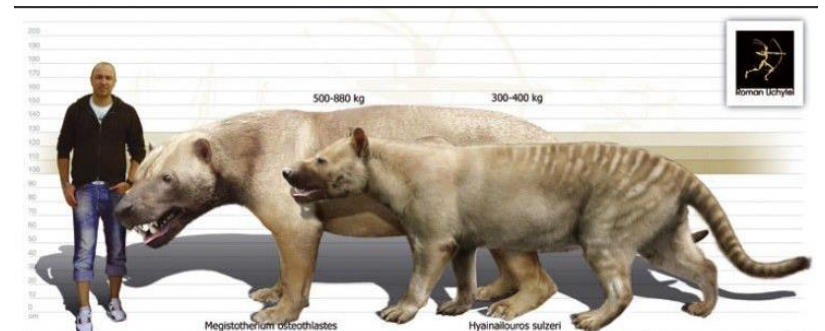


# Creodonta (Paleoceno - Mioceno):

Grupo possivelmente polifilético com morfologias convergentes à Carnivora

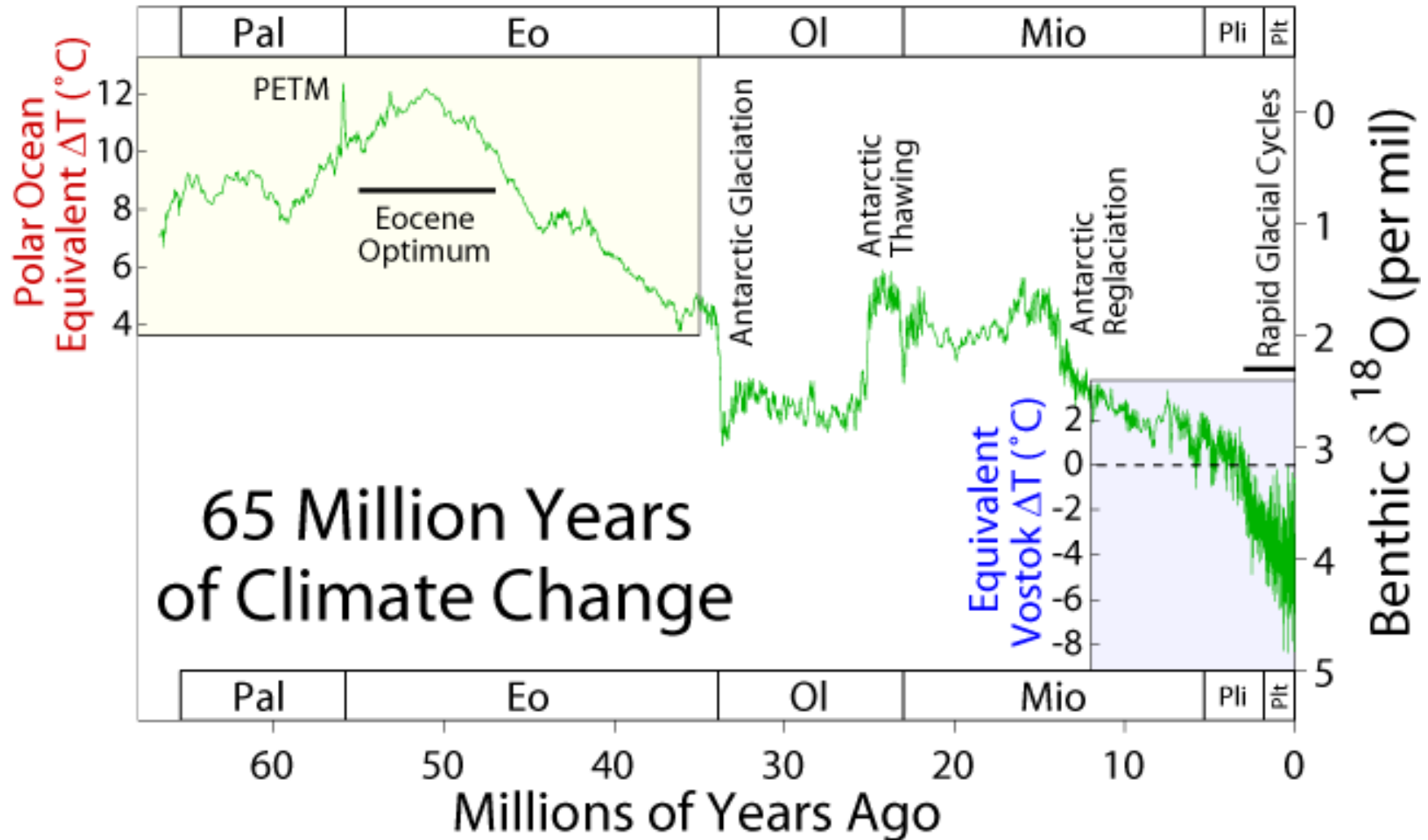


*Megistotherium* (Mioceno da África)  
Crânio duas vezes maior que o do tigre



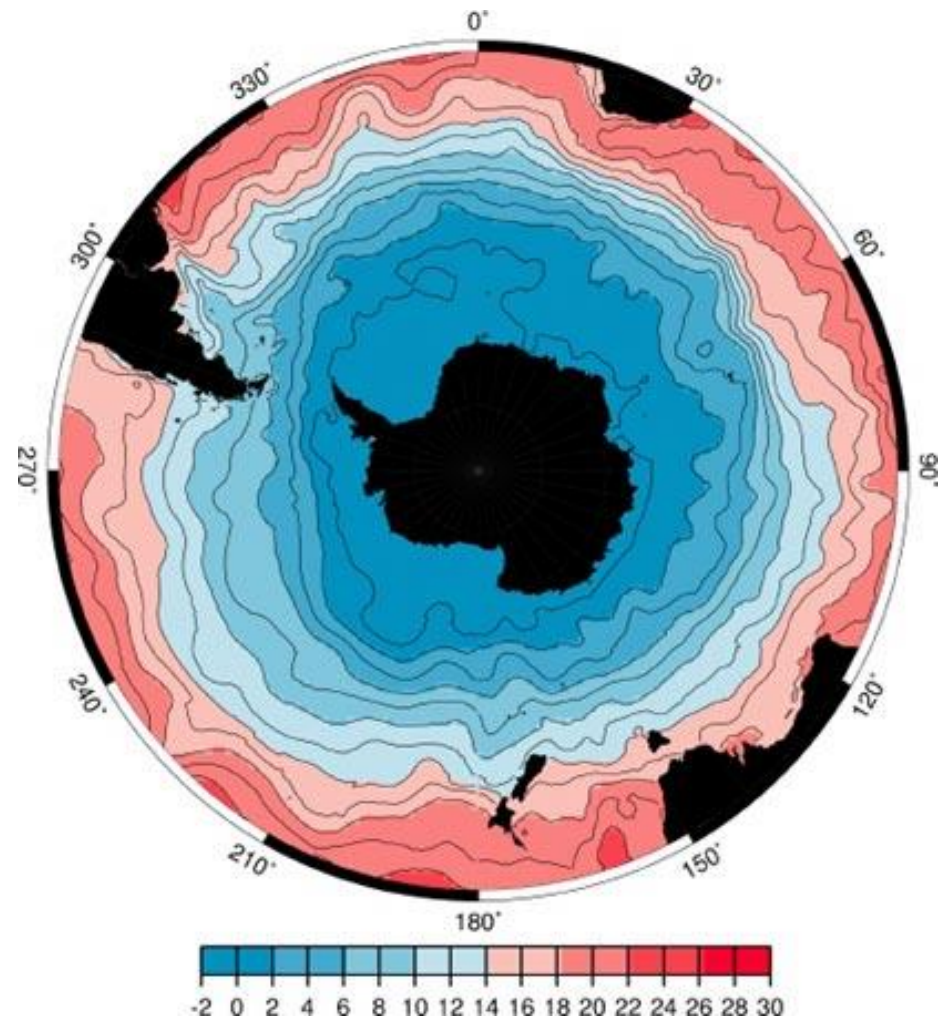
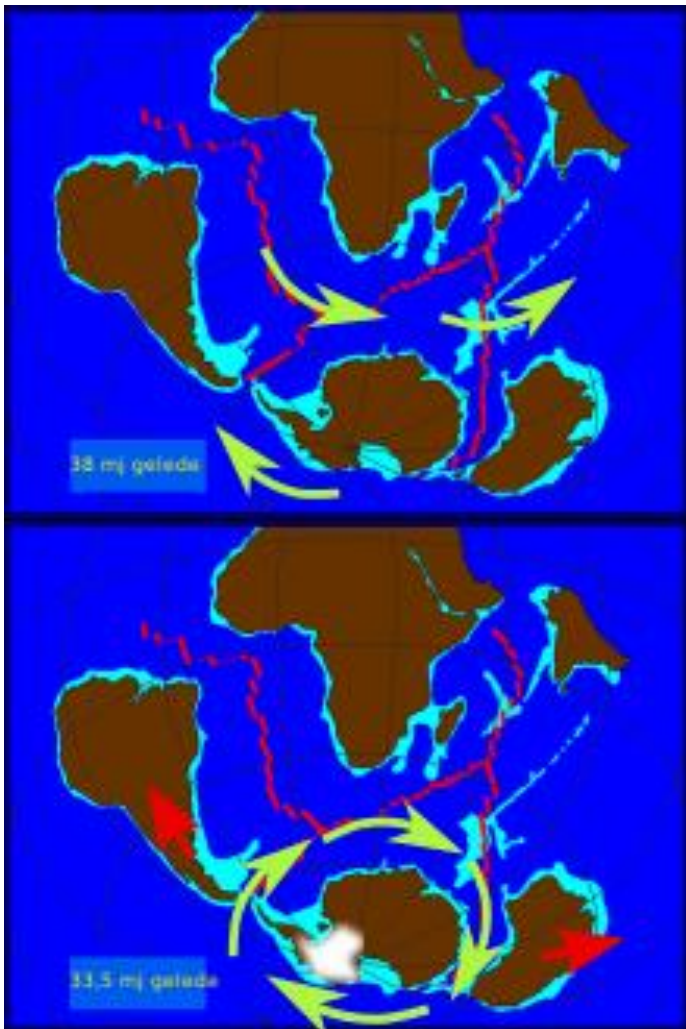
# Oligoceno

Resfriamento geral e mudanças faunísticas (*Grande Coupure*)



# Oligoceno

Formação da corrente circumpolar antártica e das calotas polares



# Neogeno 23-2,5 Ma (Mioceno-Plioceno)

Middle Miocene 14 Ma



Ancient Landmass



Modern Landmass



Subduction Zone (triangles point in the direction of subduction)

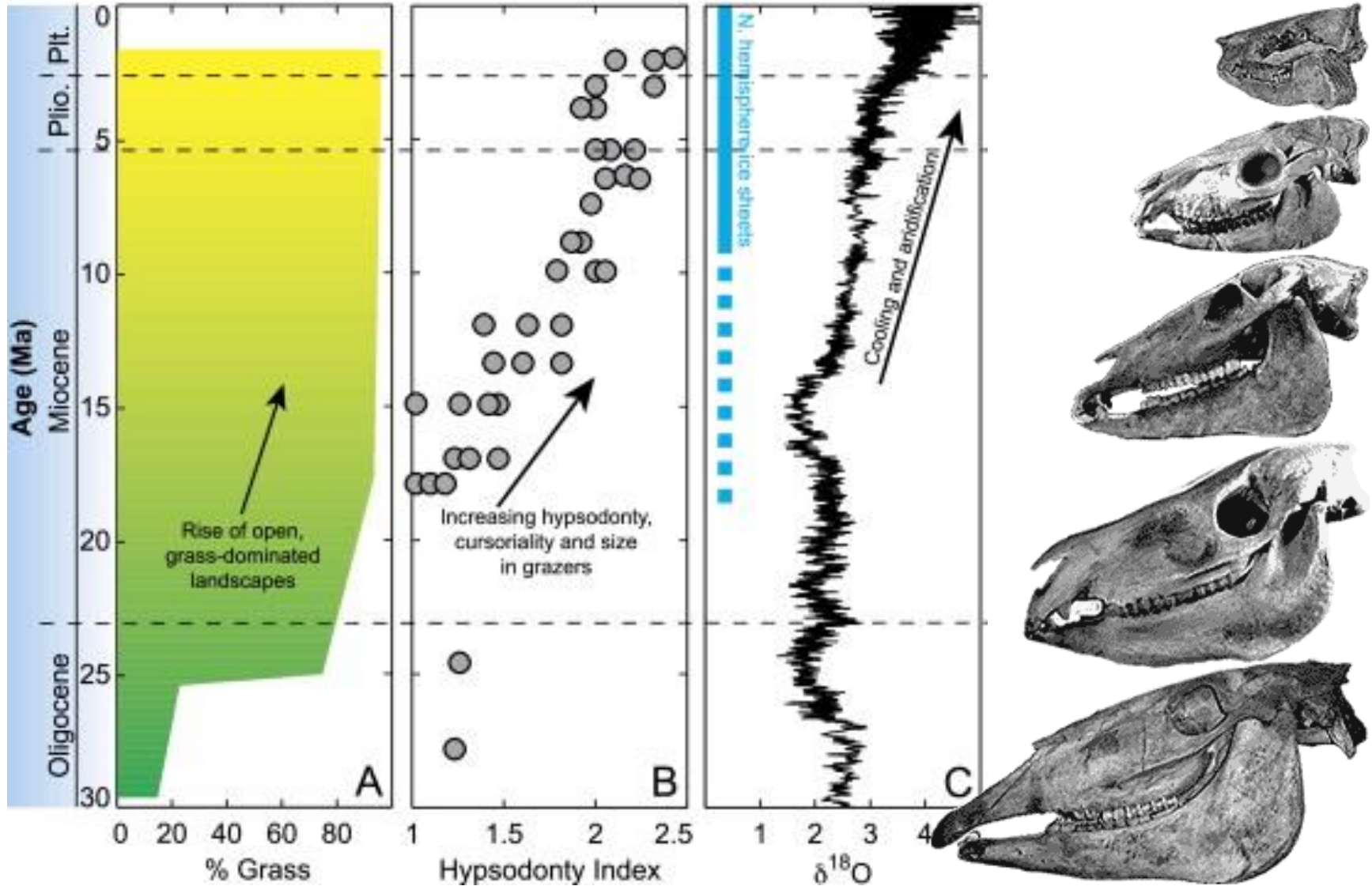


Sea Floor Spreading Ridge



# Neogeno (Mioceno)

Expansão das gramíneas e dos molares hipsodontes



## Expansão das savanas (ao longo do Mioceno)

Irradiação das gramíneas e dos pastadores cursoriais com molares hipsodontes (coroas altas com espessa camada de esmalte)



# Expansão das savanas (ao longo do Mioceno)

Artiodáctilos hipsodontes na Eurásia, África e América do Norte

Cavalos na Eurásia e América do Norte, e meridiungulados na América do Sul





# **Perissodactyla** (Eoceno – Recente)

Rhinocerotidae (Eoceno – Recente)

## *Teleoceras*

Forma de hábito mais anfíbio  
(Ashfall Park, Mioceno de Nebraska)



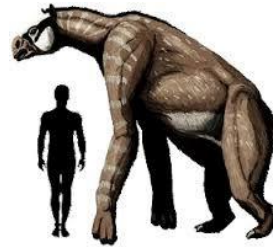
# Ashfall Park (Mioceno de Nebraska)



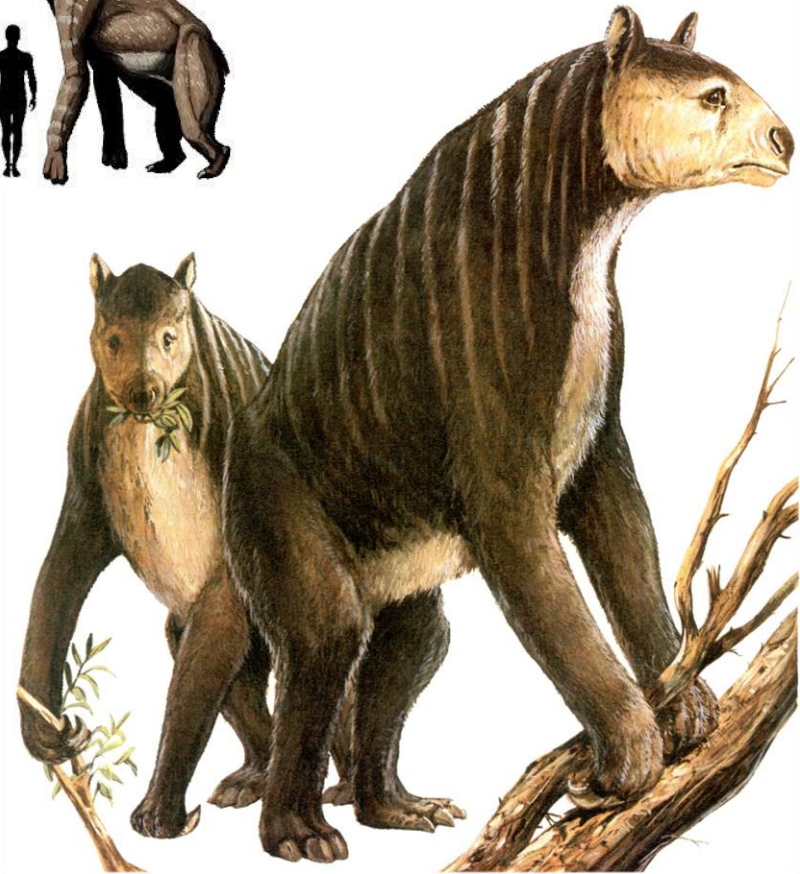
# Perissodactyla (Eoceno – Recente)

Chalicotheridae (Eoceno – Pleistoceno)

Táxons derivados com patas anteriores longas e mãos para *knuckle-walking*



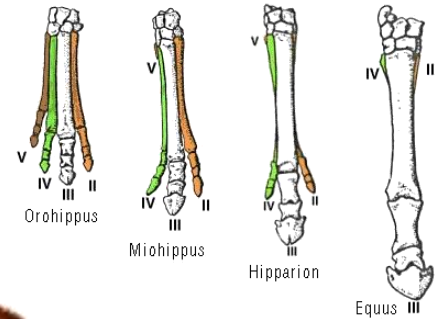
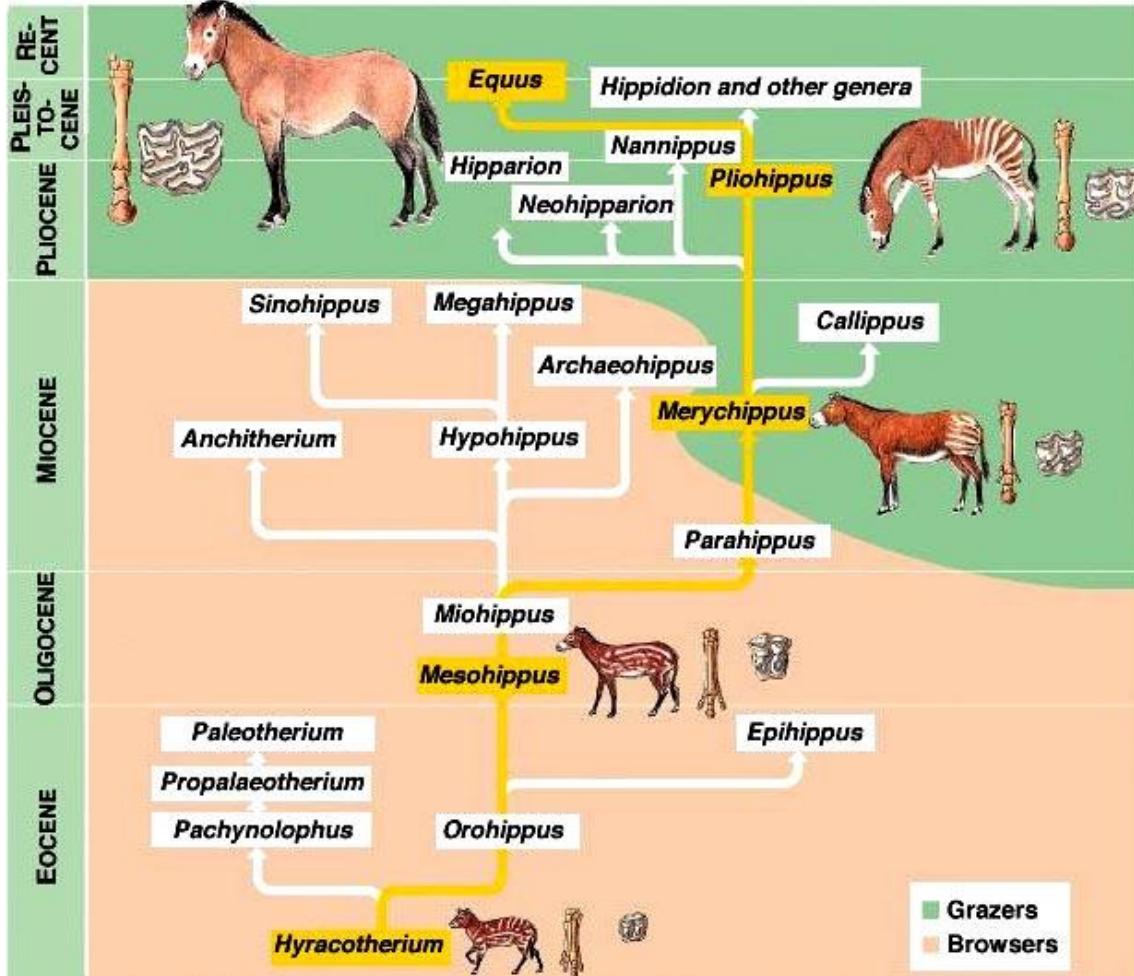
*Chalicotherium*  
Mioceno  
Eurásia e África



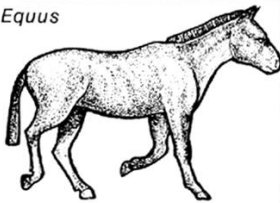
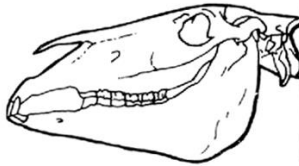
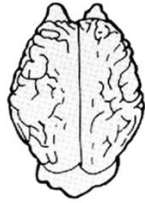





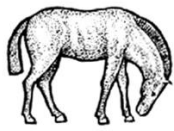







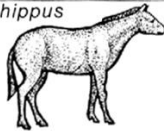




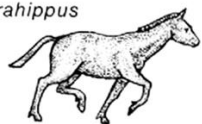











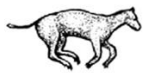







# Perissodactyla (Eoceno – Recente)

## Equidae (Eoceno – Recente)

Maiores, redução de dedos, dentes para maceração



# Perissodactyla (Eocene – Recente)

		Skull	Brain	Upper molar Crown	Side	Side	Front foot With soft tissues	Anteri
Recent and Pleistocene	<i>Equus</i> 							
Pliocene	<i>Pliohippus</i> 					Grazers 		
Miocene	<i>Merychippus</i> 							
	<i>Parahippus</i> 					Browsers 		
Oligocene	<i>Meshippus</i> 							
Eocene	<i>Hyracotherium</i> 							

# **Perissodactyla** (Eoceno – Recente)

Equidae (Eoceno – Recente): Mioceno

Transição entre folhívoros e pastadores



*Anchitherium*

Passagem de molares com coroas-baixas para altas e de crescimento contínuo



*Merychippus*

## **Perissodactyla** (Eoceno – Recente)

Equidae (Eoceno – Recente): pastadores do Mioceno

Aumento das pastagens e dispersão para a Ásia



*Merychippus*  
(Mioceno da América do Norte)

# Perissodactyla (Eoceno – Recente)

Equidae (Eoceno – Recente): pastadores do Plioceno-Recente



*Pliohippus* e *Hipparion*  
(Eurásia e América do Norte)



*Equus przewalskii*





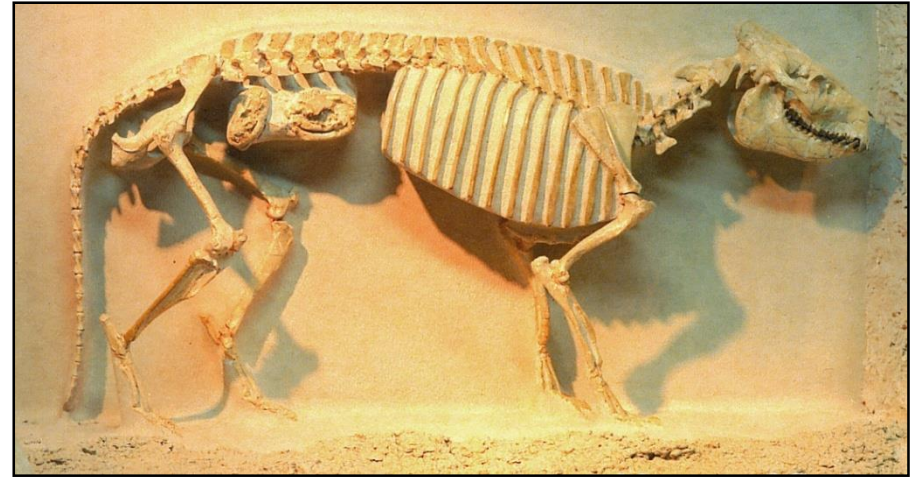
# **Artiodactyla** (Eoceno – Recente)

Tylopoda (Eoceno – Recente) – Camelos, Llamas e afins

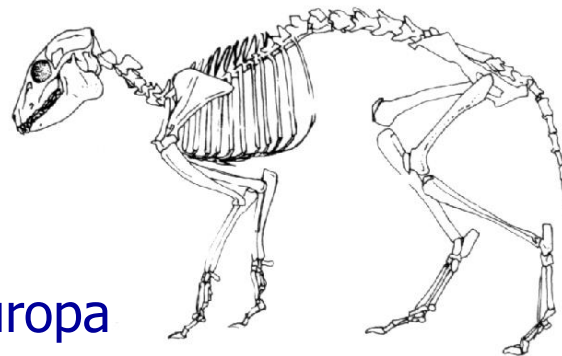
Formas basais da América do Norte e Europa com cascos e pequeno tamanho



*Cainotherium* do Oligoceno da Europa




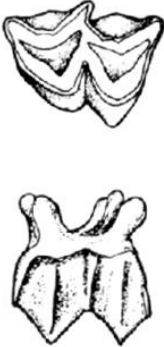




*Merceyoidodon*: oreodonte do Oligoceno dos EUA



# Artiodactyla (Eoceno – Recente)

Camelidae (Eoceno – Recente) - Camelos e Llamas

Formas sem casco, abundantes no terciário da América do Norte

	Foot	Teeth
<i>Procamelus</i> Miocene		
<i>Poebrotherium</i> Oligocene		
<i>Protylopus</i> Eocene		

*Poebrotherium*, forma basal  
(Oligoceno dos EUA)

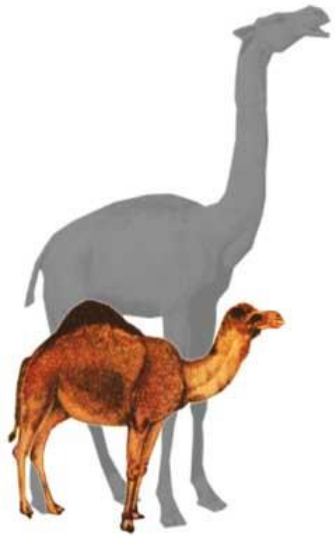


Algumas formas  
convergentes  
à gazelas  
*Stenomylus*  
(Mioceno dos EUA)

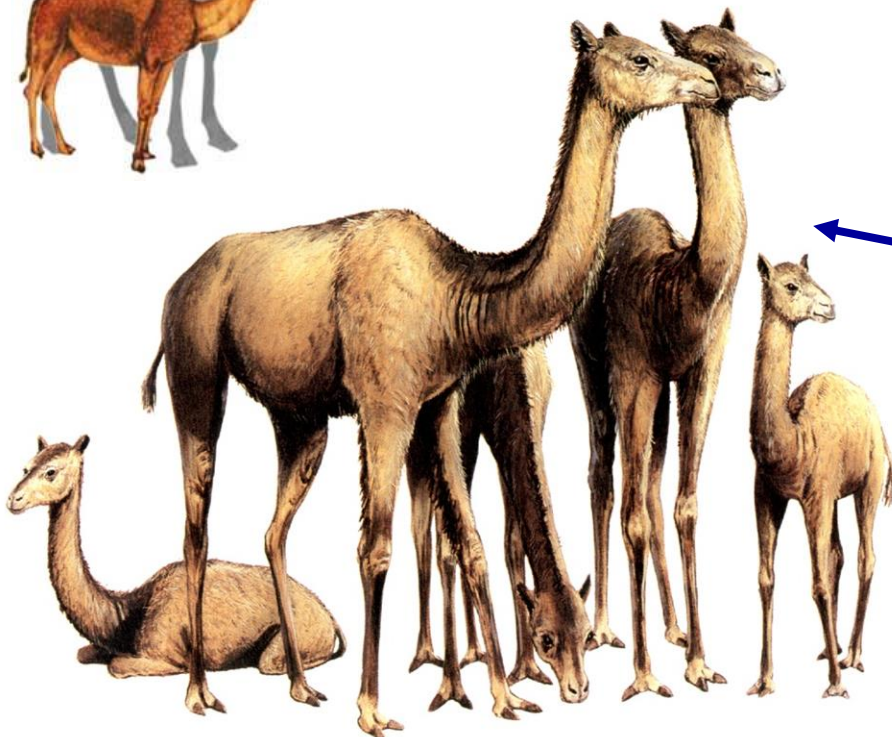
# Artiodactyla (Eoceno – Recente)

Camelidae (Eoceno – Recente) - Camelos e Llamas

Formas sem casco, abundantes no terciário da América do Norte



*Titanotylopus*  
Plioceno  
América do Norte



*Oxydactylus* e *Protolabis*  
Mioceno da América do Norte



# **Artiodactyla** (Eoceno – Recente)

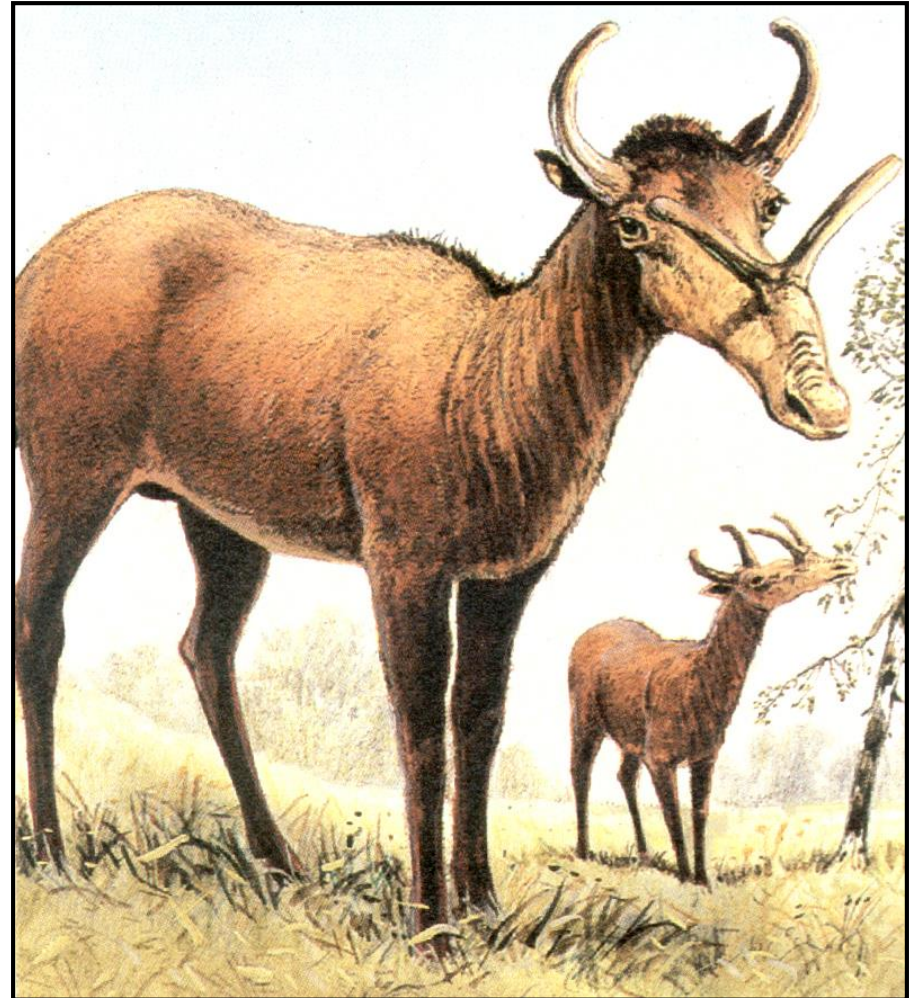
Protoceratidae (Eoceno – Plioceno da América do Norte)

Grupo irmão de Camelidae ou afim aos ruminantia

*Syndyoceras* do Mioceno da América do Norte



*Kyptoceras* Plioceno dos EUA



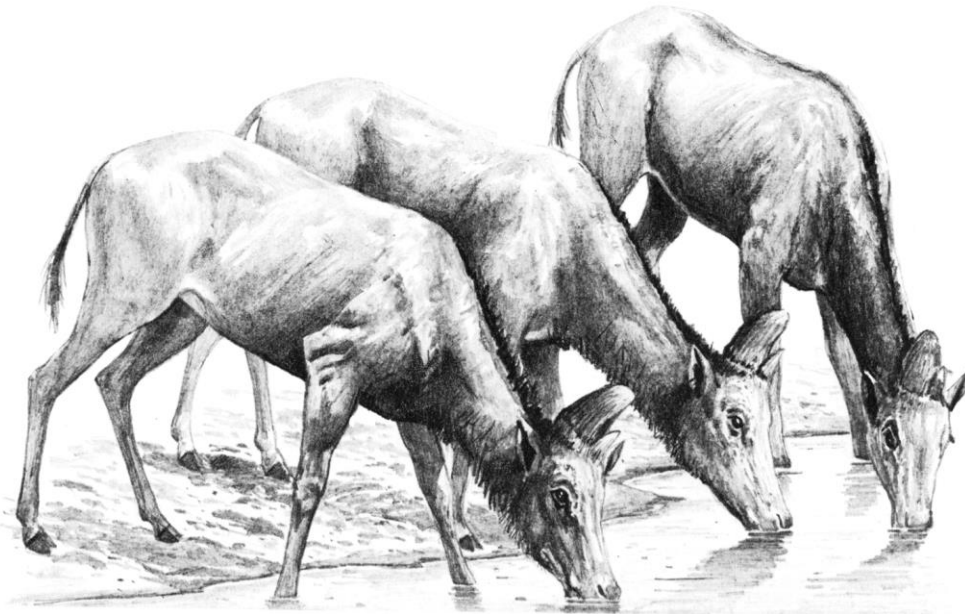
# **Artiodactyla** (Eoceno – Recente)

Pecora (Mioceno-Recente): Bovidae (Mioceno-Recente)

Pastadores de distribuição Africana e Eurasiana (dominantes na África)

Dispersão para América do Norte no Pleistoceno

Antilocapridae (Mioceno-Recente) - Distribuição Norte-Americana



*Tsaidamotherium*: Mioceno da Mongólia  
(corno direito central e hipertrofiado)



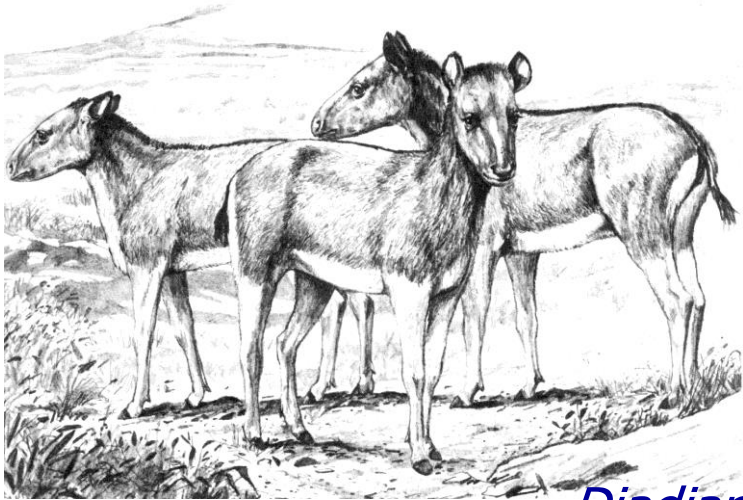
*Hexameryx*  
(Mioceno da Flórida)

# Meridiungulata (Paleoceno - Recente)

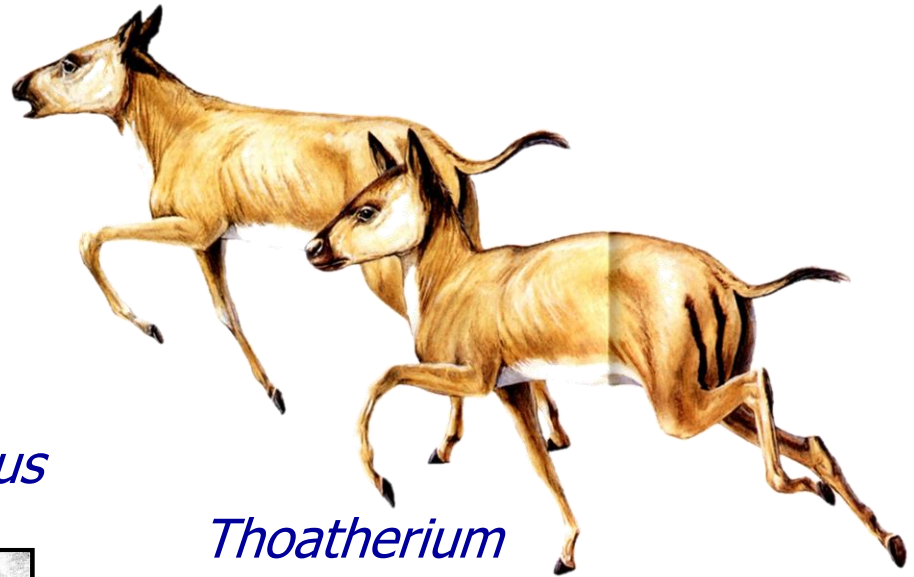
Litopterna (Paleoceno – Pleistoceno)

Possível irradiação independente dos demais Meridiungulata

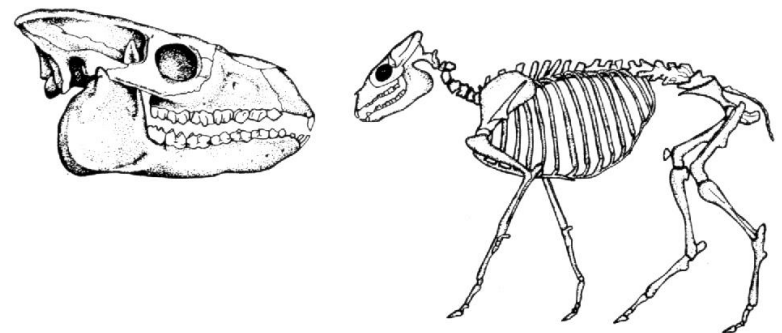
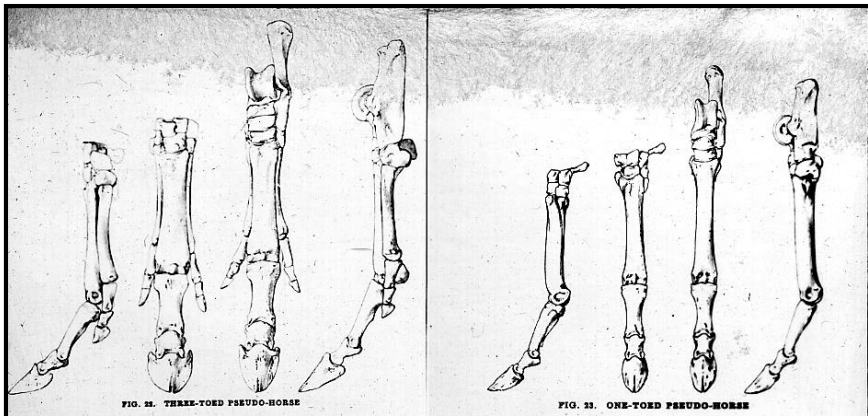
Formas de médio porte convergentes com o cavalo (Mioceno da Patagônia)



*Diadiaphorus*



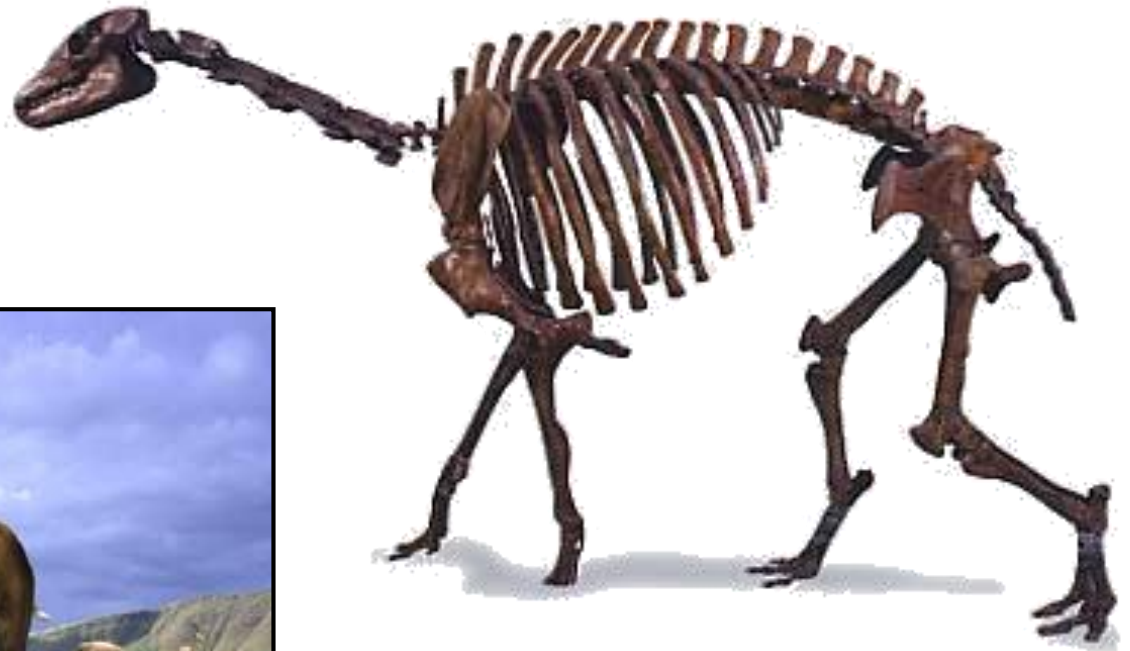
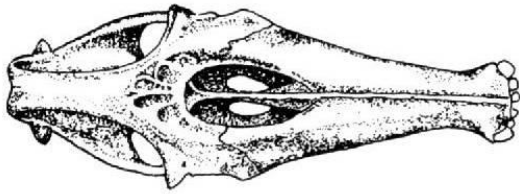
*Thoatherium*



# Meridiungulata (Paleoceno - Recente)

Litopterna (Paleoceno – Pleistoceno)

*Macrauchenia*: formas de grande porte com probóscide



# **Meridiungulata** (Paleoceno - Recente)

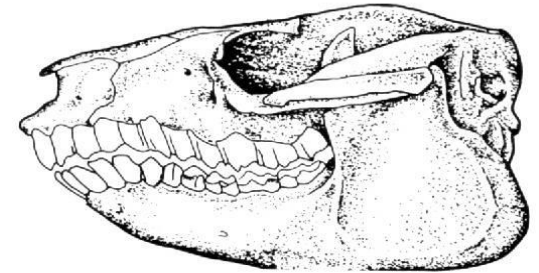
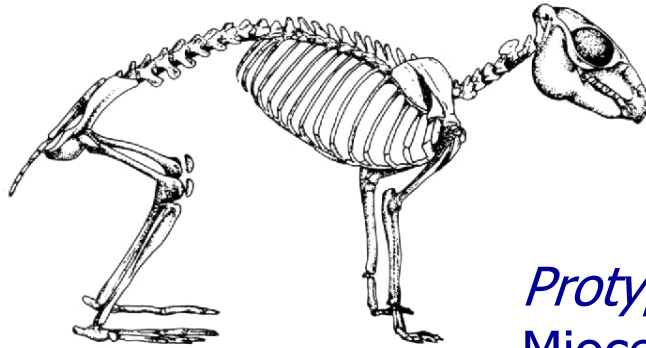
Notoungulata (Paleoceno – Pleistoceno)

Typotheria: caninos reduzidos e alguns com incisivos alongados de raiz aberta

Registro no Eoceno sugere irradiação precoce das gramíneas



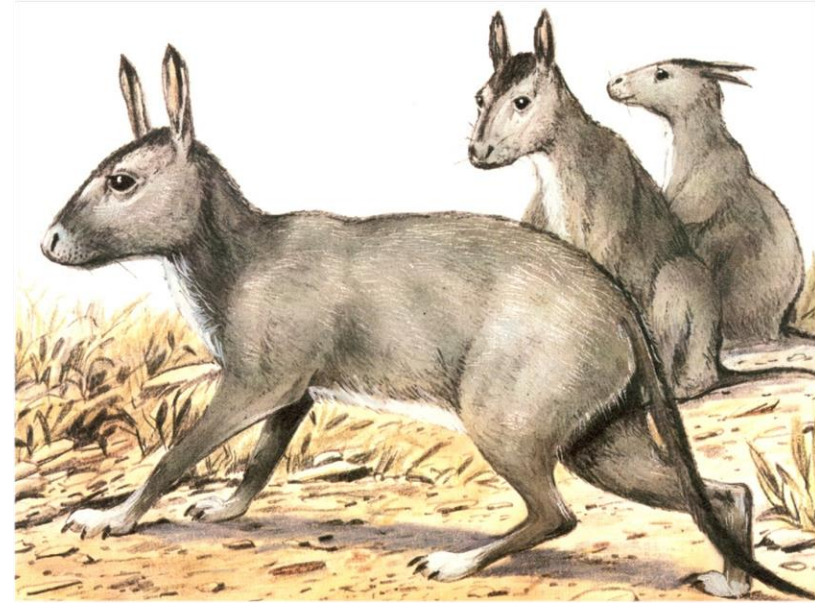
*Mesotherium:*  
Pleistoceno



*Protypotherium:*  
Mioceno da Patagônia



*Padeotherium:*  
Plioceno da Argentina

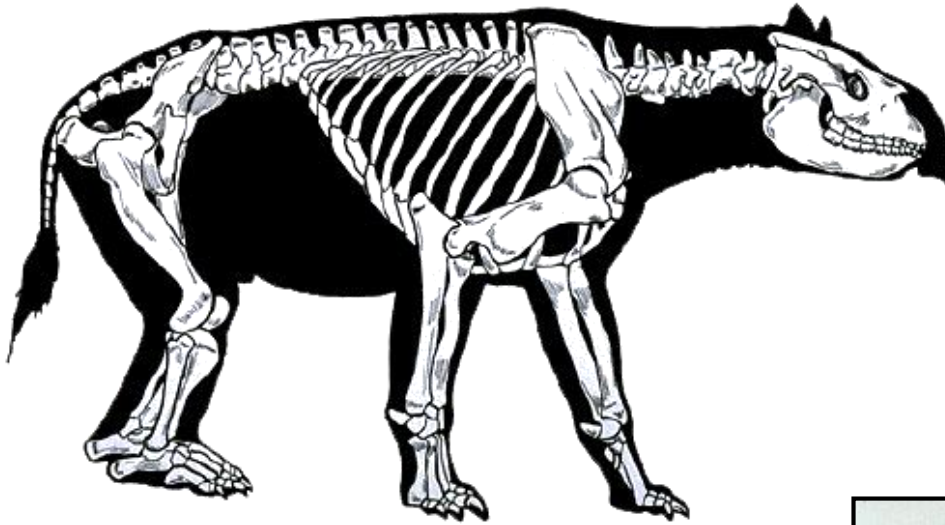




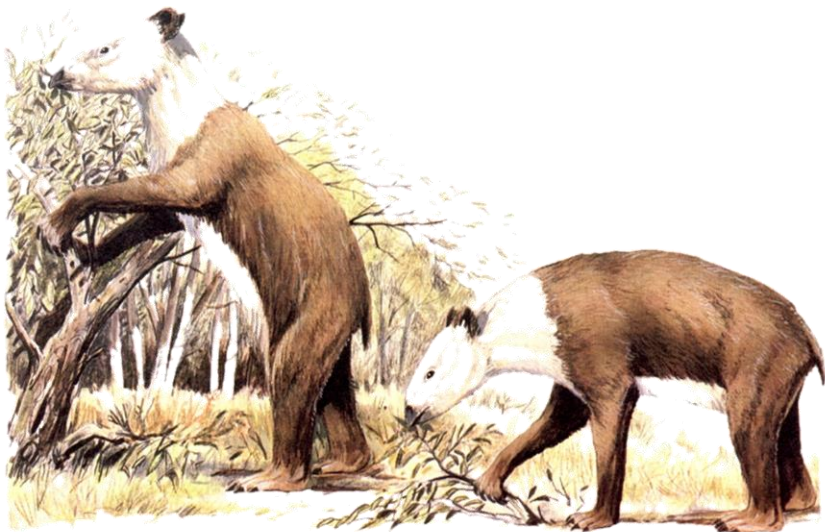
# Meridiungulata (Paleoceno - Recente)

Notoungulata (Paleoceno – Pleistoceno)

Toxodonta: algumas formas de grande porte até 2 m de comprimento



*Homalodotherium*: herbívoro  
Mioceno da Patagonia membros  
anteriores mais robustos



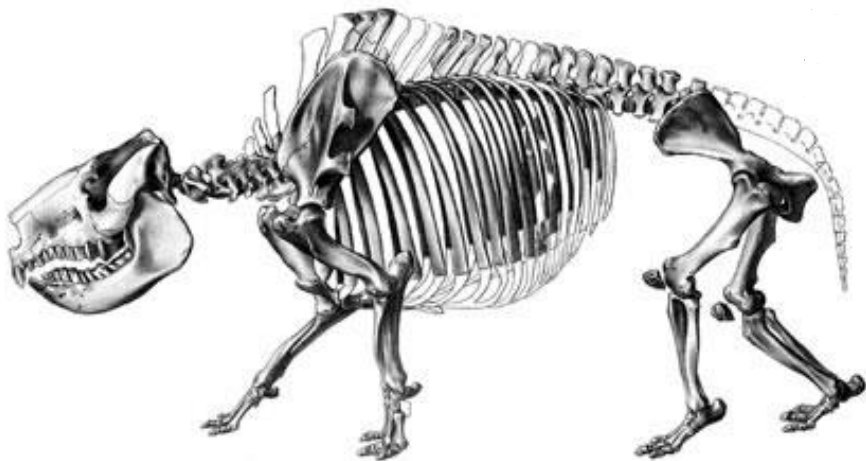
# Meridiungulata (Paleoceno - Recente)

Notoungulata (Paleoceno – Pleistoceno)

Grupo mais diverso de ungulados sul americanos

## *Nesodon*

Formas de grande porte  
Mioceno da Patagonia

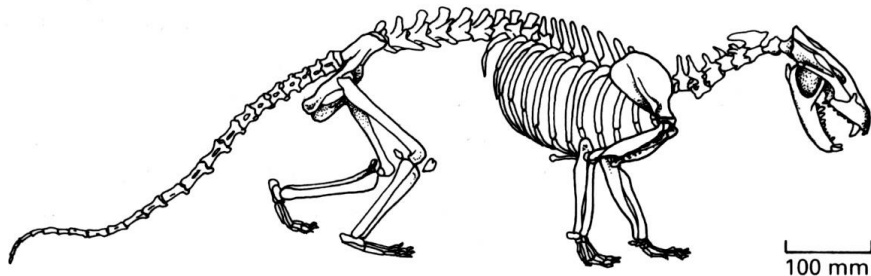


# “Ameridelphia” (Paleoceno – Recente)

Inclui carnívoros de médio porte: Borhyaenidae (Mioceno-Plioceno)



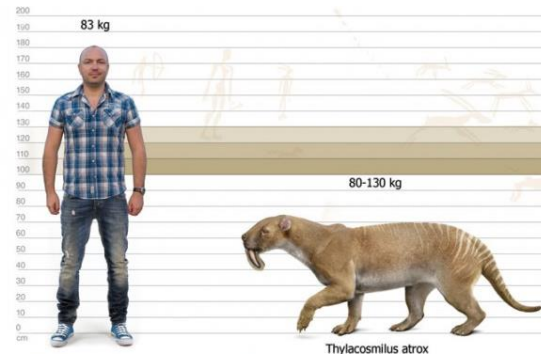
*Pseudoborhyaena*  
(Oligoceno, Argentina)



*Protylacinus* (Mioceno, Argentina)

# “Ameridelphia” (Paleoceno – Recente)

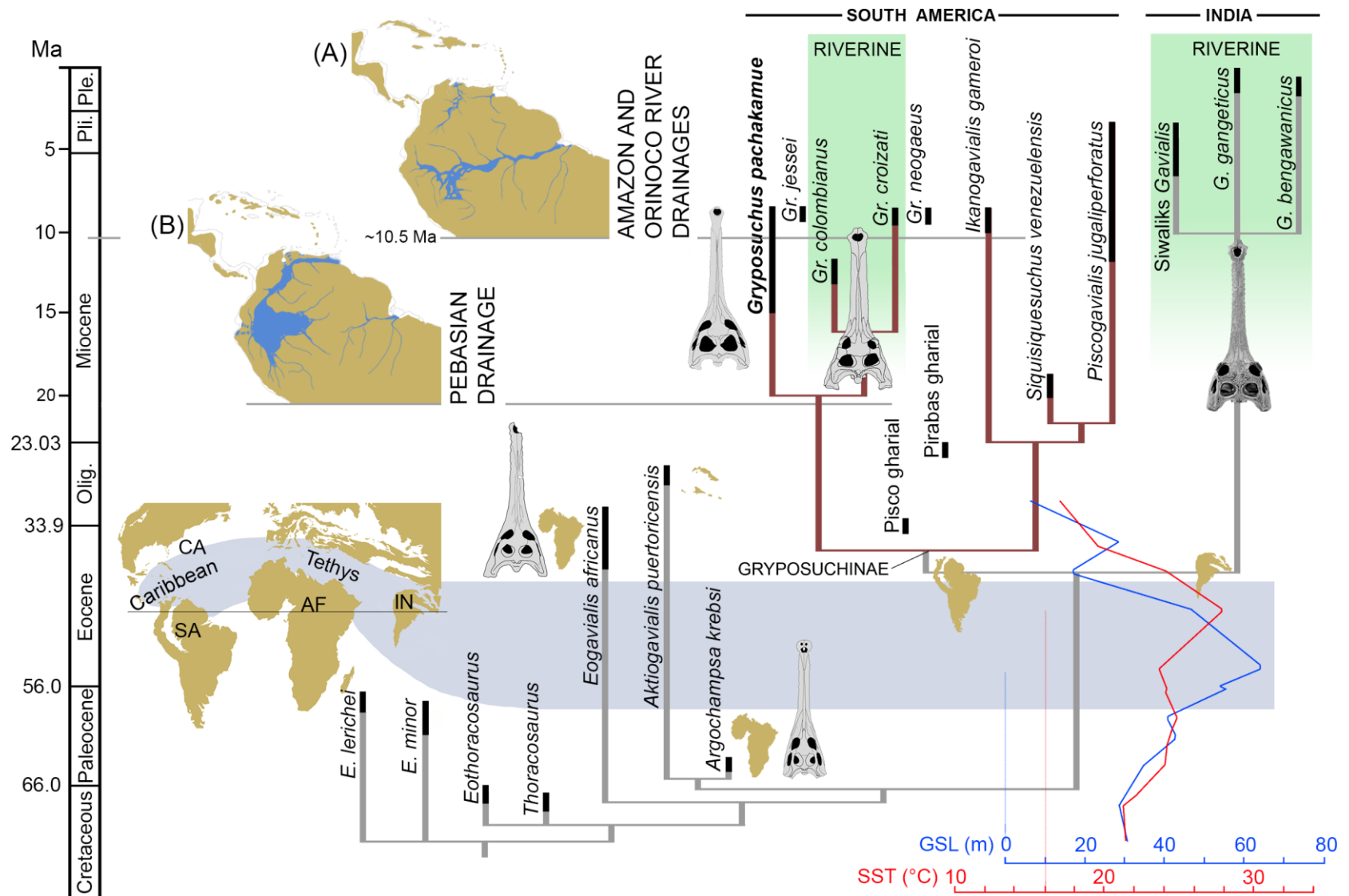
*Thylacosmilus* (Plioceno, Argentina)



## Fm. Solimões (Oligo-Mioceno do Acre)



# Fm. Solimões (Oligo-Mioceno do Acre)



# Gavialoidea (Cretáceo sup. - Recente)

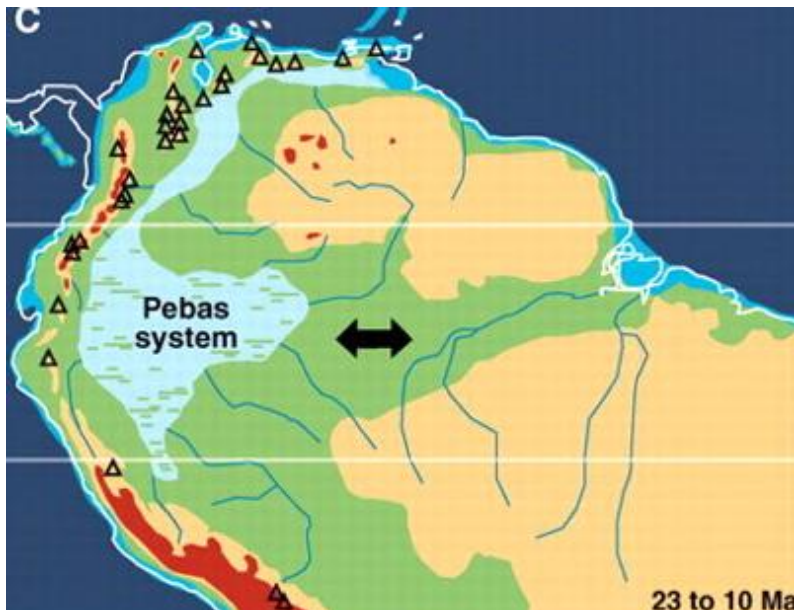
No Brasil: Formação Solimões, Mioceno do Acre



*Hesperogavialis*



*Gryposuchus*

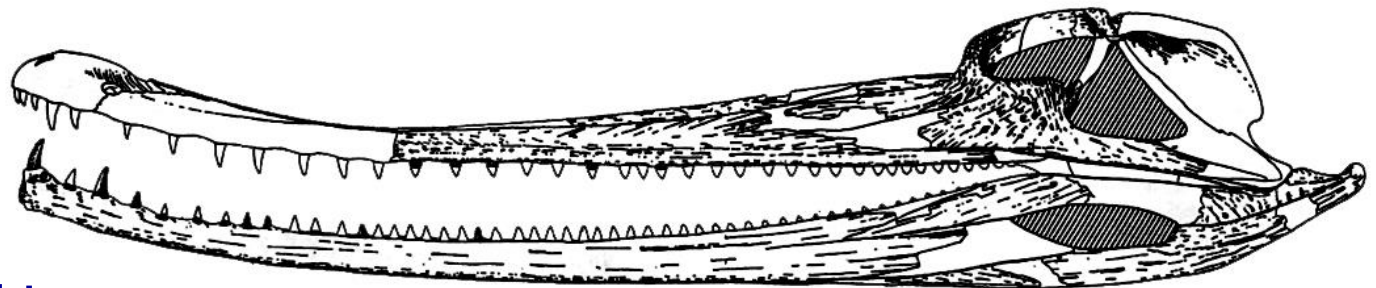


# Caimaninae (Cretáceo sup. - Recente)

*Acresuchus*



*Mourasuchus*



*Nettosuchus*  
Mioceno da Colômbia



## **Caimaninae** (Cretáceo sup. - Recente)

*Purussaurus brasiliensis*

Mioceno do Acre

Crânio completo: 1,3 m

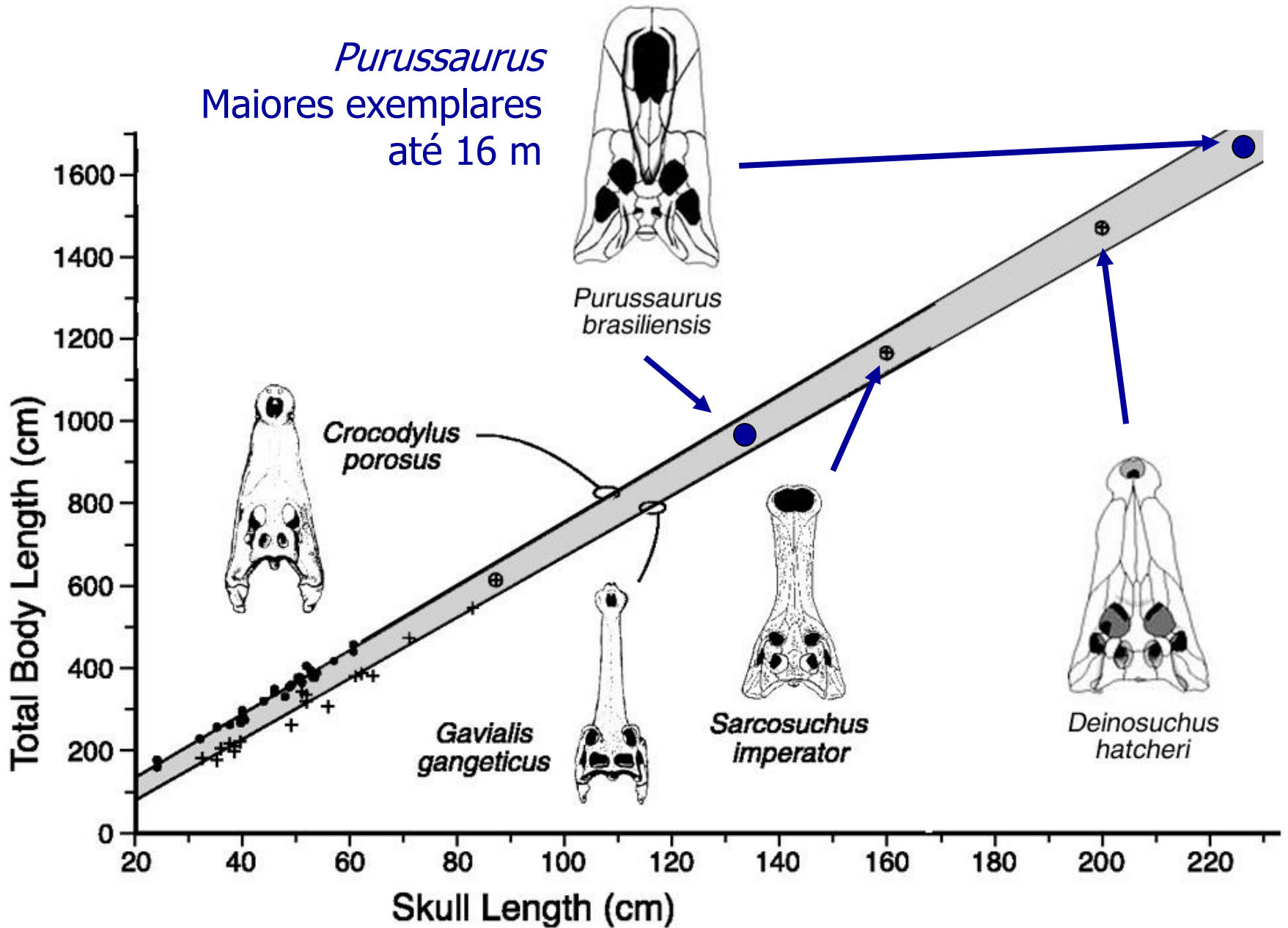
Tamanho estimado (10 m)



## **Caimaninae** (Cretáceo sup. - Recente)



# Os maiores crocodilos

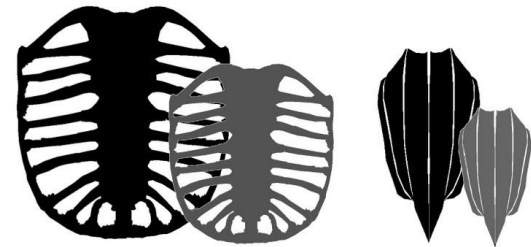
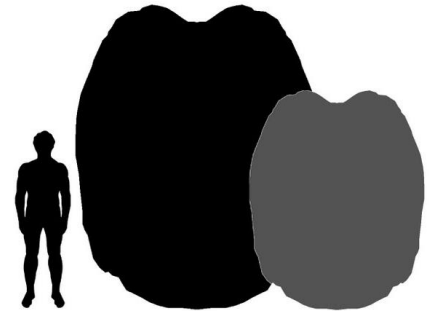


# Podocnemidae (Cretáceo inf. – Recente)

*Stupendemys geographicus* (Mioceno da Venezuela e Brasil)



Maior quelônio não marinho  
Talvez maior de todos!  
(mais de 3 m de compr.)



# Podocnemidae (Cretáceo inf. – Recente)

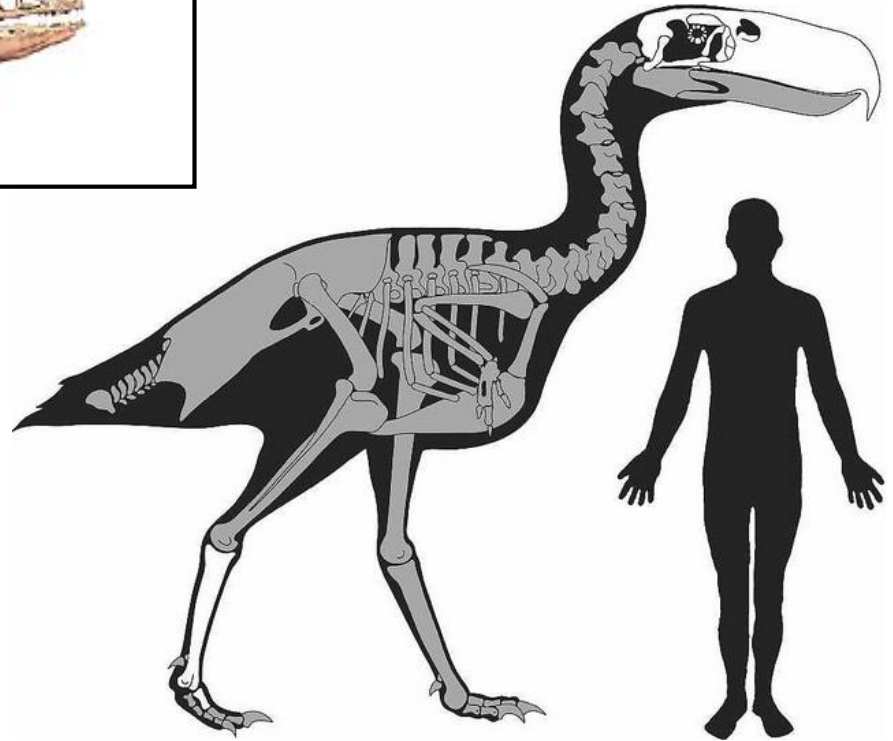
*Stupendemys geographicus*  
(Mioceno do Brasil  
e Venezuela)



# Phorusrhacidae (Paleoceno-Pleistoceno)

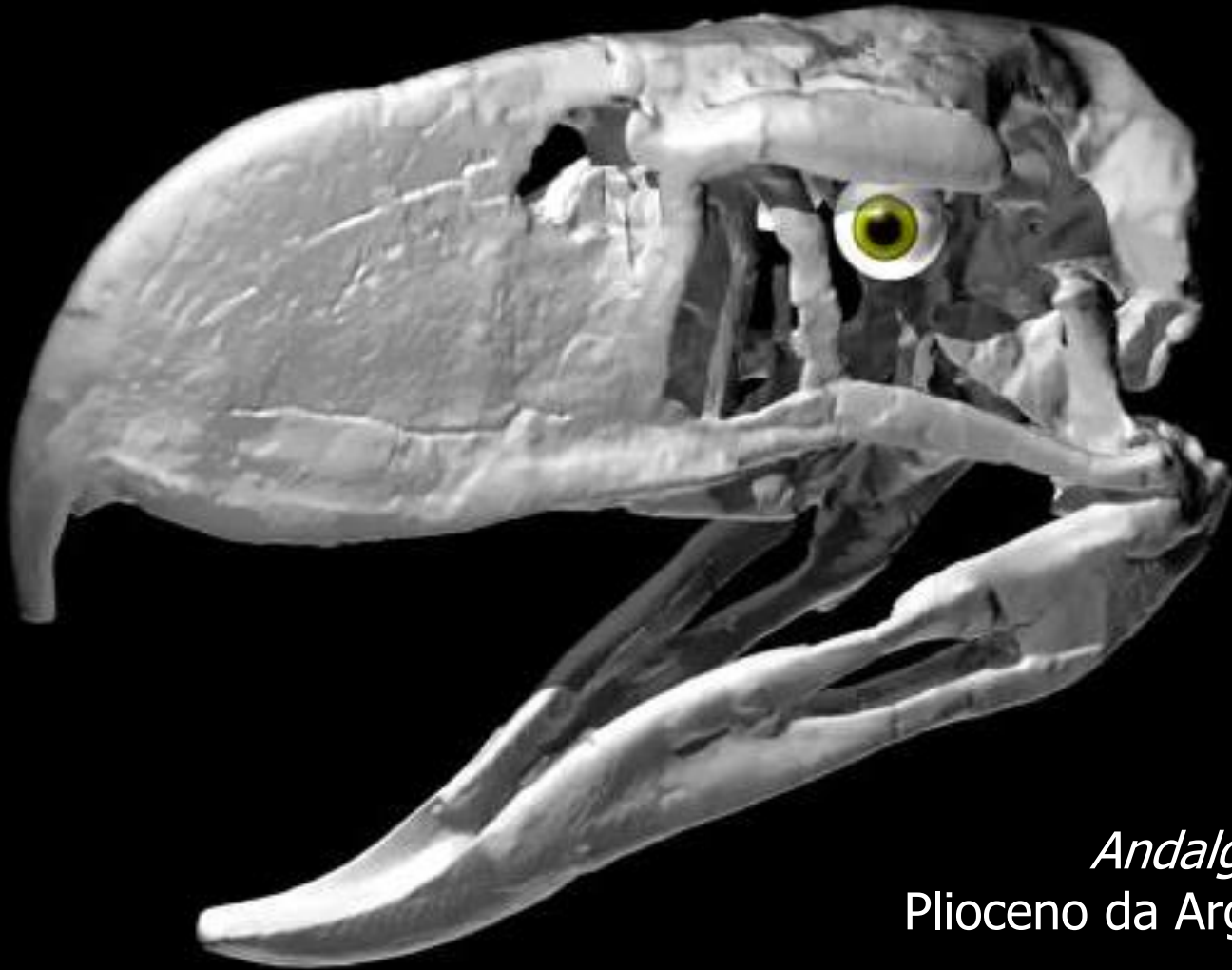
No Brasil: *Paraphysornis brasiliensis* (Oligo-Mioceno de Taubaté)

formas carnívoras de grande porte (até 3 m)



*Andalgalornis*  
Plioceno da Argentina

# Phorusrhacidae (Paleoceno-Pleistoceno)



*Andalgornis*  
Plioceno da Argentina

# Phorusrhacidae (Paleoceno-Pleistoceno)

1. African Ostrich

2. Diatryma

3. Elephant Bird

4. South Island Giant Moa

5. Phorusrhacos

6. North Island Giant Moa

7. Greater Rhea

8. Darwin's Rhea

9. Southern Cassowary

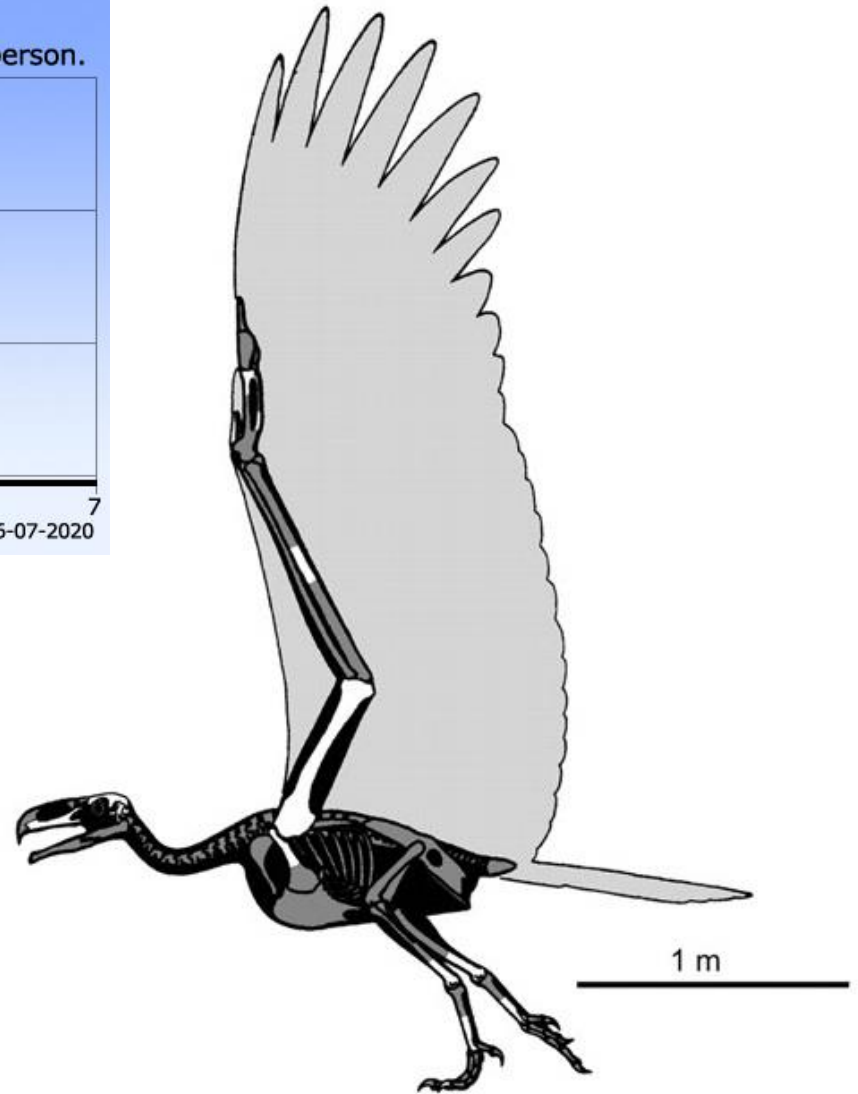
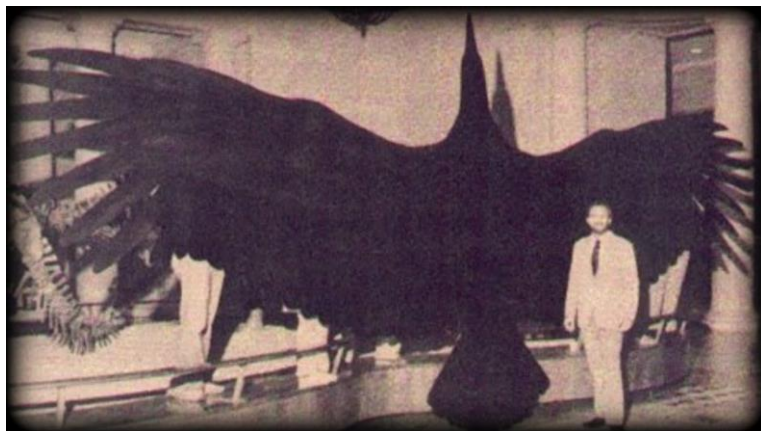
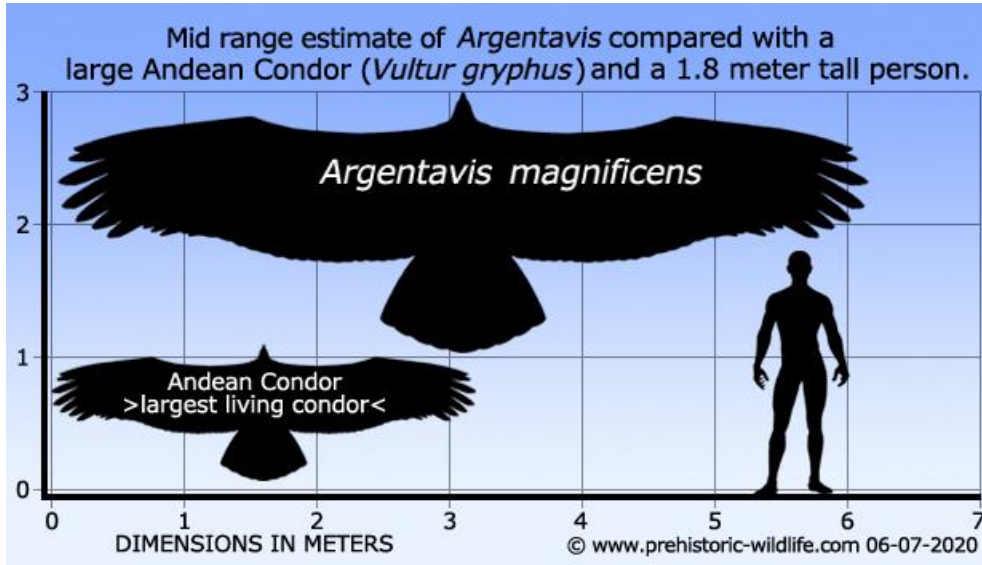
10. Emu

11. Dodo





# Teratornithidae (Mioceno-Pleistoceno): inclui a maior ave voadora *Argentavis* (Mioceno da Argentina) 7,5 m de envergadura e 70 kg



**Teratornithidae** (Mioceno-Pleistoceno): inclui a maior ave voadora  
*Argentavis* (Mioceno da Argentina) 7,5 m de envergadura e 70 kg

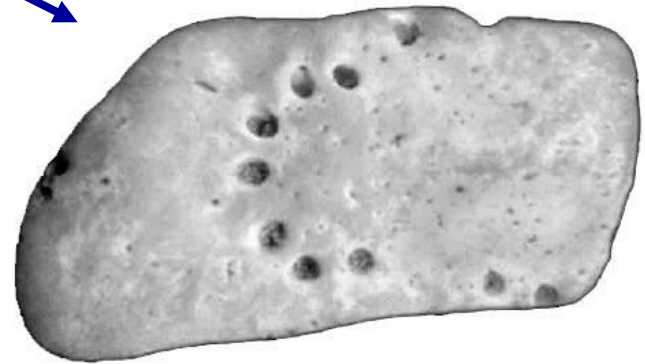
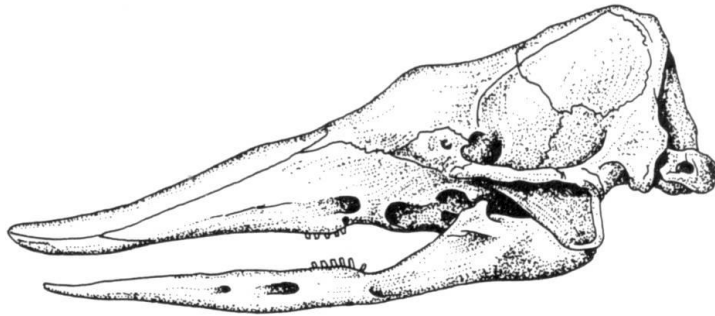


# Xenarthra (Paleoceno – Recente)

Loricata = Cingulata (tatus e gliptodontes) - Cobertura de placas dérmicas

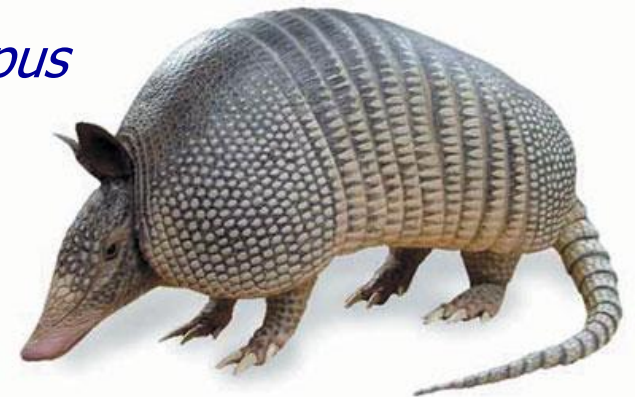
“Dasypodoidea”: parafilético à Gliptodontidae, formas menores e onívoras

Primeiro registro: *Riosthegotherium* do Paleoceno de Itaboraí



*Sthegotherium* (Mioceno, Argentina)

*Dasypus*



# **Xenarthra** (Paleoceno – Recente)

Loricata = Cingulata (tatus e gliptodontes) - Cobertura de placas dérmicas

“Dasypodoidea”: parafilético à Gliptodontidae, formas menores e onívoras

Inclui: Dasypodidae, Peltephilidae e Pamphathiidae

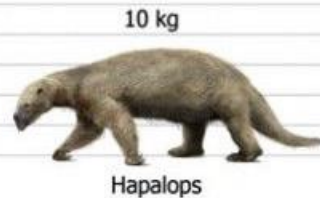
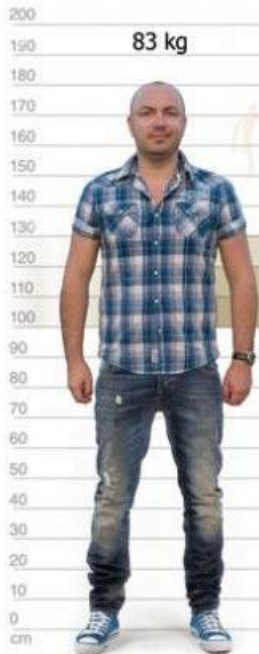


*Paltephilus*  
(Mioceno, Patagonia)

*Chorobates*  
(Mioceno, Argentina)

# Xenarthra (Paleoceno – Recente)

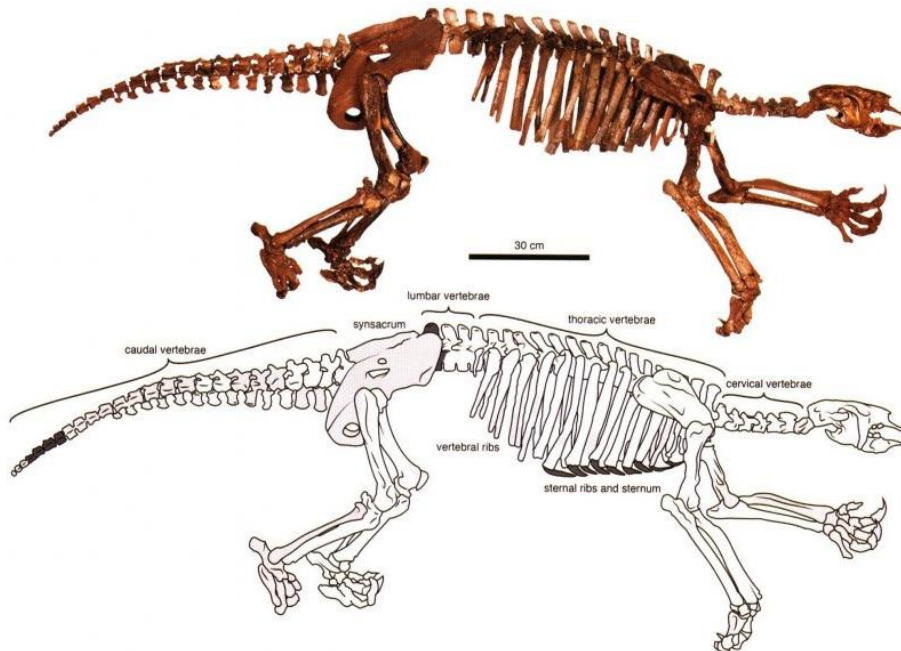
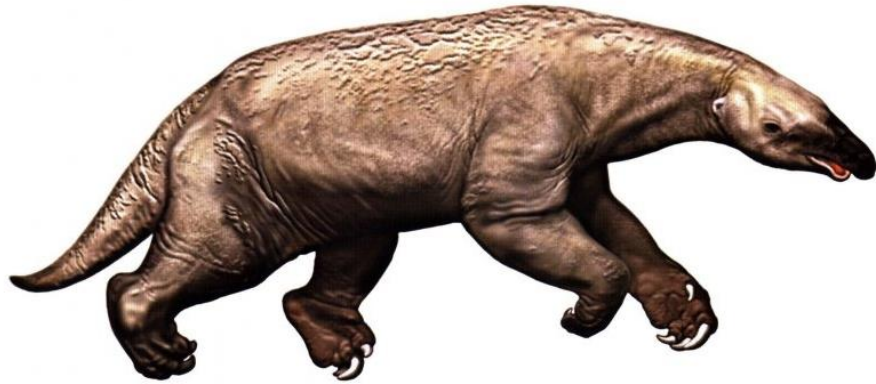
Tardigrada (Oligoceno sup. – Recente): preguiças terrestres



*Hapalops*: Mioceno do Brasil, Colômbia, Bolívia e Argentina

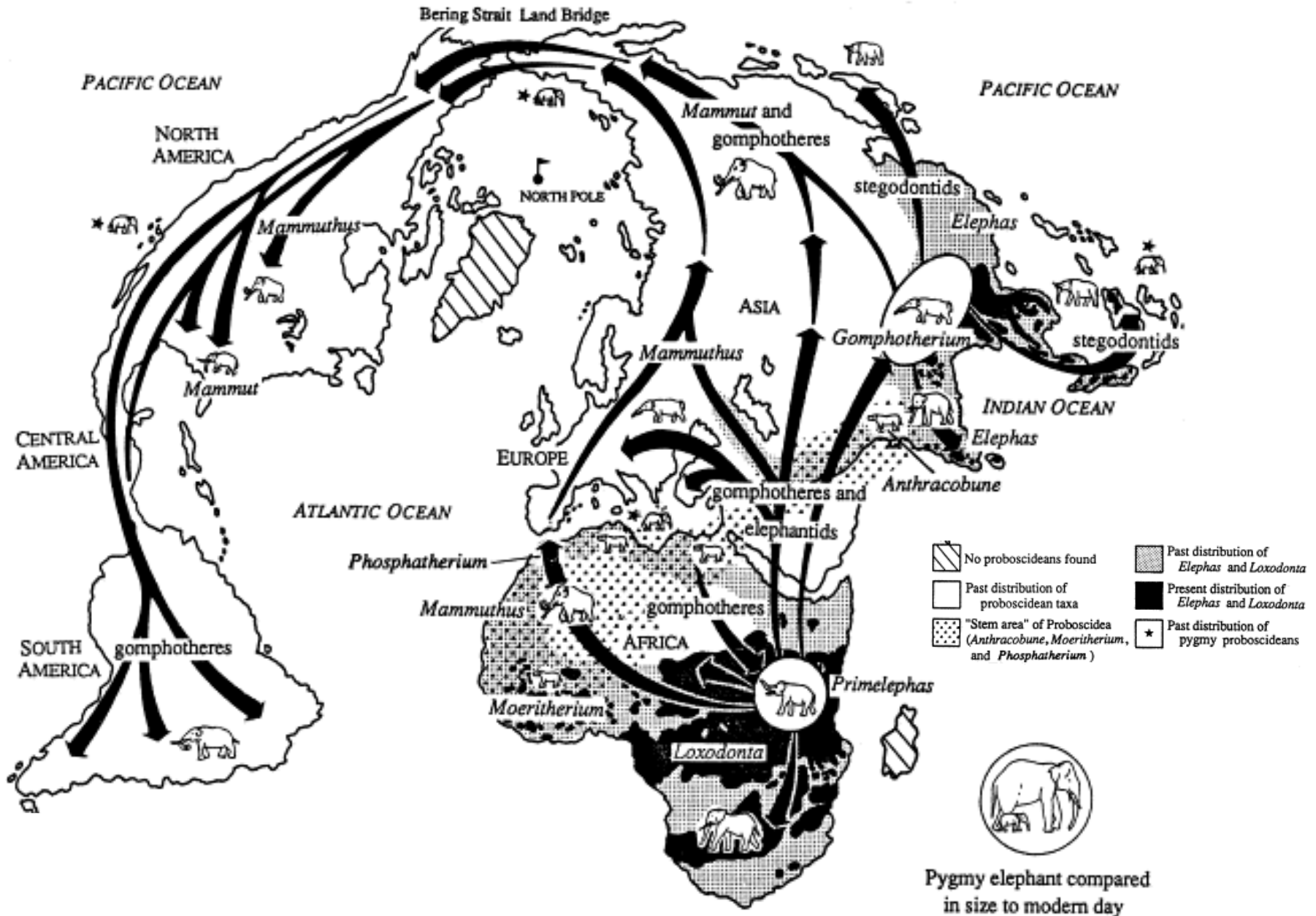
# Xenarthra (Paleoceno – Recente)

Tardigrada (Oligoceno sup. – Recente): Megatheridae, gigantes terrestres



*Thalassocnus*: forma aquática do Mioceno do Peru

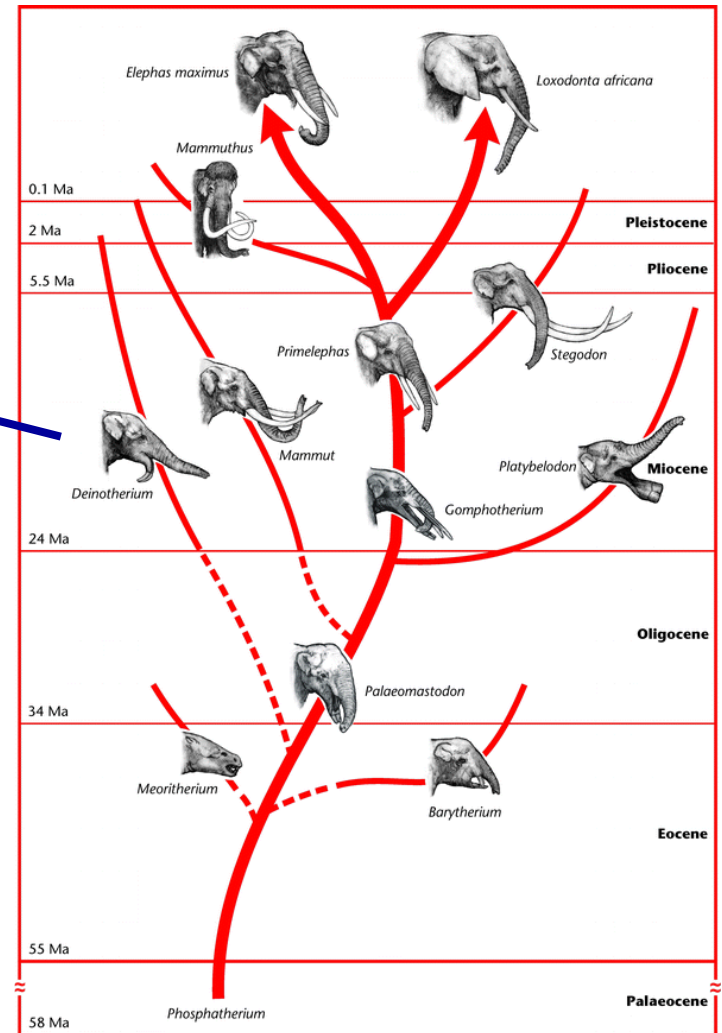
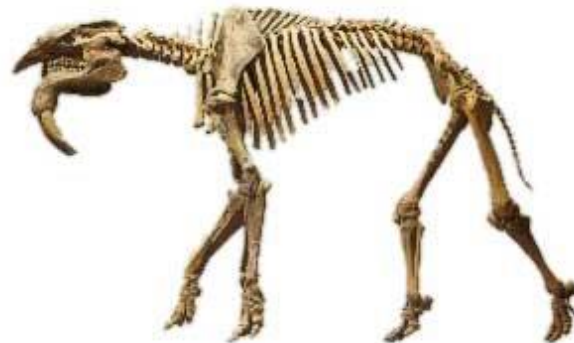
# Proboscidea (Paleoceno – Recente)



# Proboscidea (Paleoceno – Recente)

Deinotheria: Oligoceno-Pleistoceno da África e Eurásia

Linhagem paralela à Elephantiformes com incisivos inferiores curvos

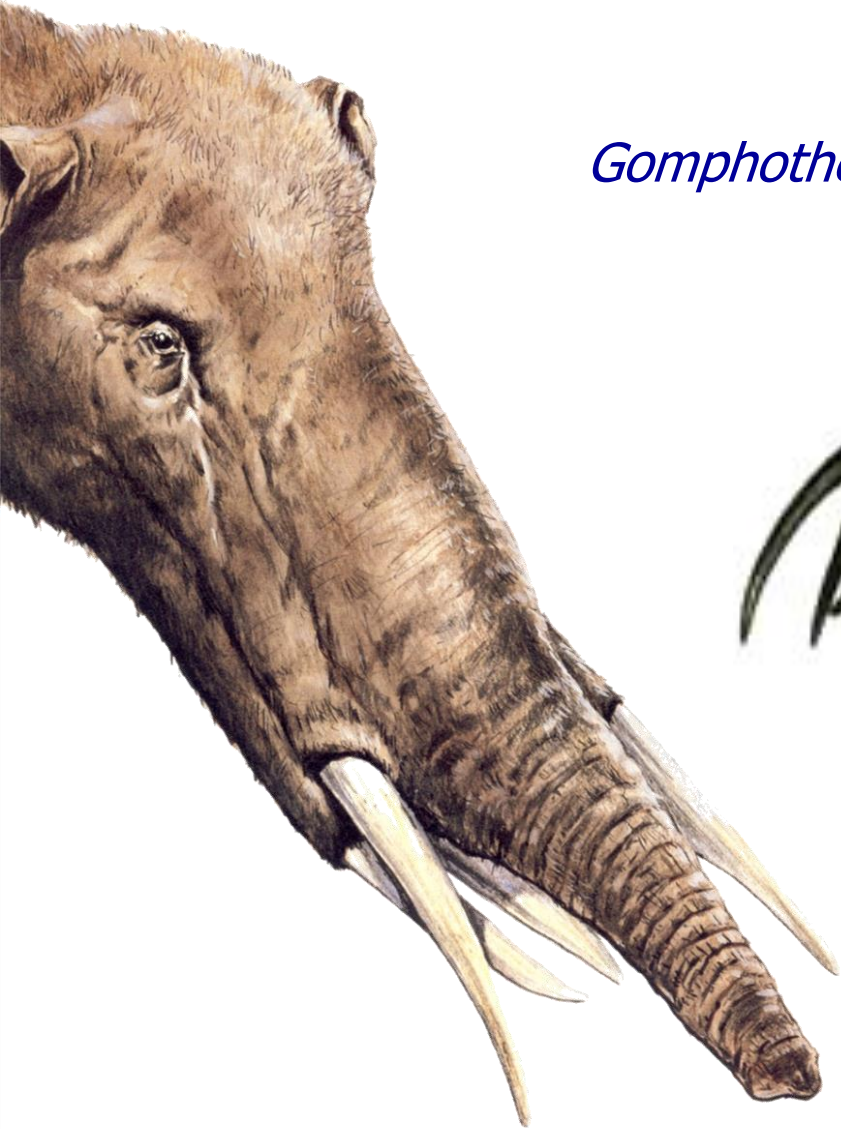




**Proboscidea** (Paleoceno – Recente)

Elephantoidea (Eoceno - Recente)

“Gomphotheriidae” (Oligo-Plioceno da da África e Hemisfério Norte)



*Gomphotherium*: Mioceno da África e Eurásia

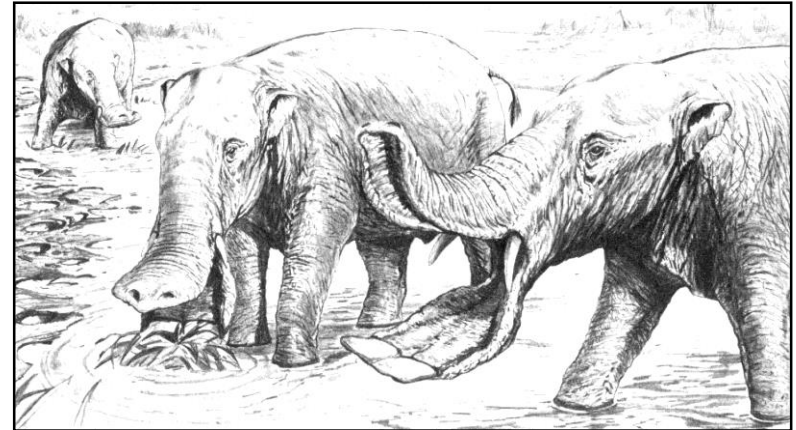
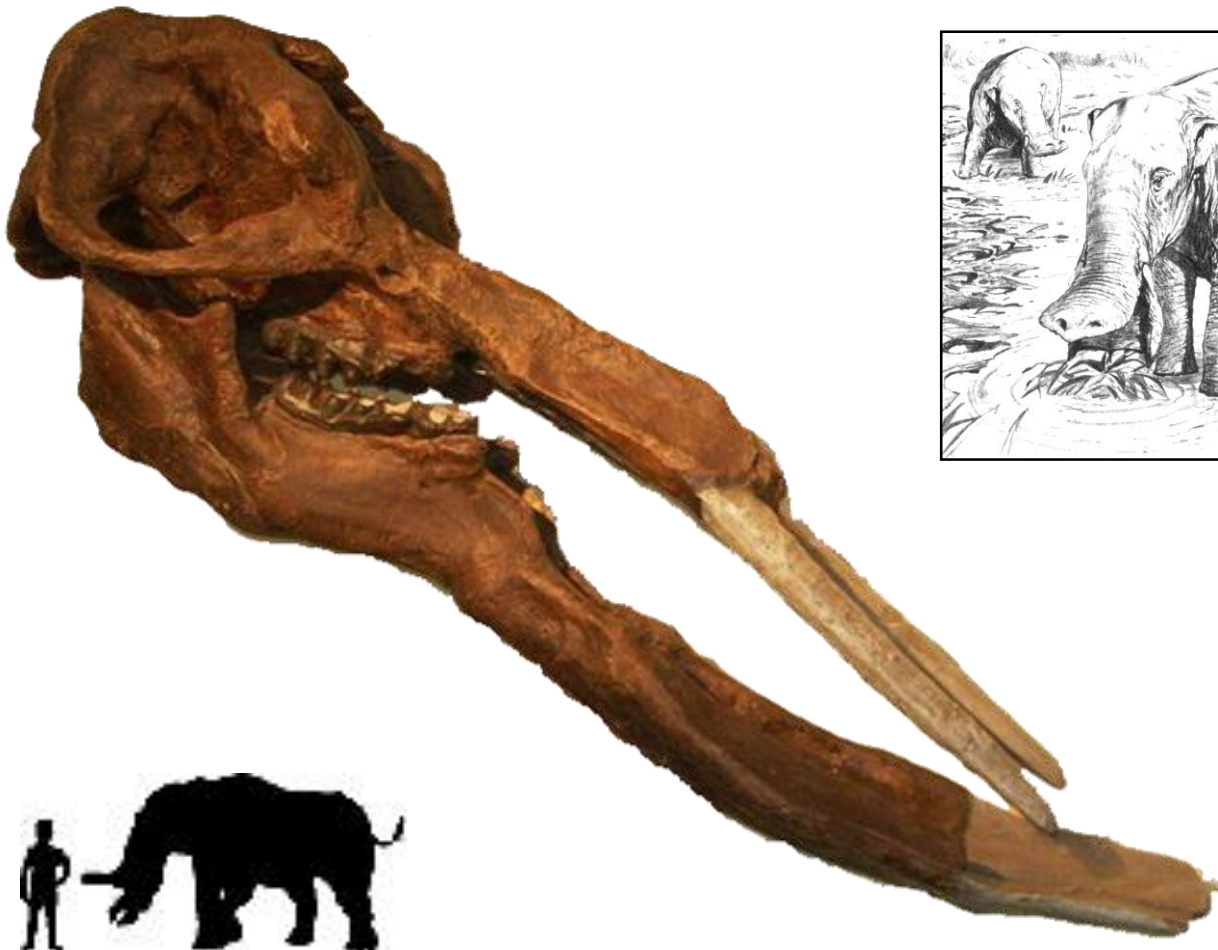


# **Proboscidea** (Paleoceno – Recente)

“Gomphotheriidae” (Mio-Plioceno da da África e Hemisfério Norte)

Grande diversidade de formas de grande porte no Terciário

Ambelodontidae (Mioceno da Ásia e América do Norte)



*Platybelodon:*  
Mioceno da Mongólia



# **Proboscidea** (Paleoceno – Recente)

“Gomphotheriidae” (Mio-Plioceno da da África e Hemisfério Norte)

Grande diversidade de formas de grande porte no Terciário  
Ambelodontidae (Mioceno da Ásia e América do Norte)



# **Proboscidea** (Paleoceno – Recente)

“Gomphotheriidae” (Mio-Plioceno da da África e Hemisfério Norte)

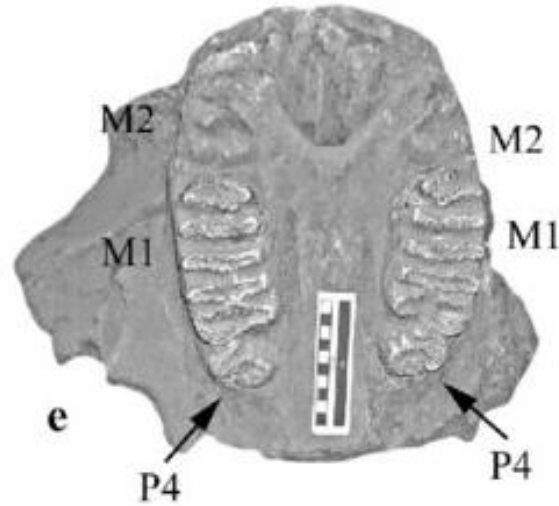
Molares para maceração e tendência ao desenvolvimento de probóscides



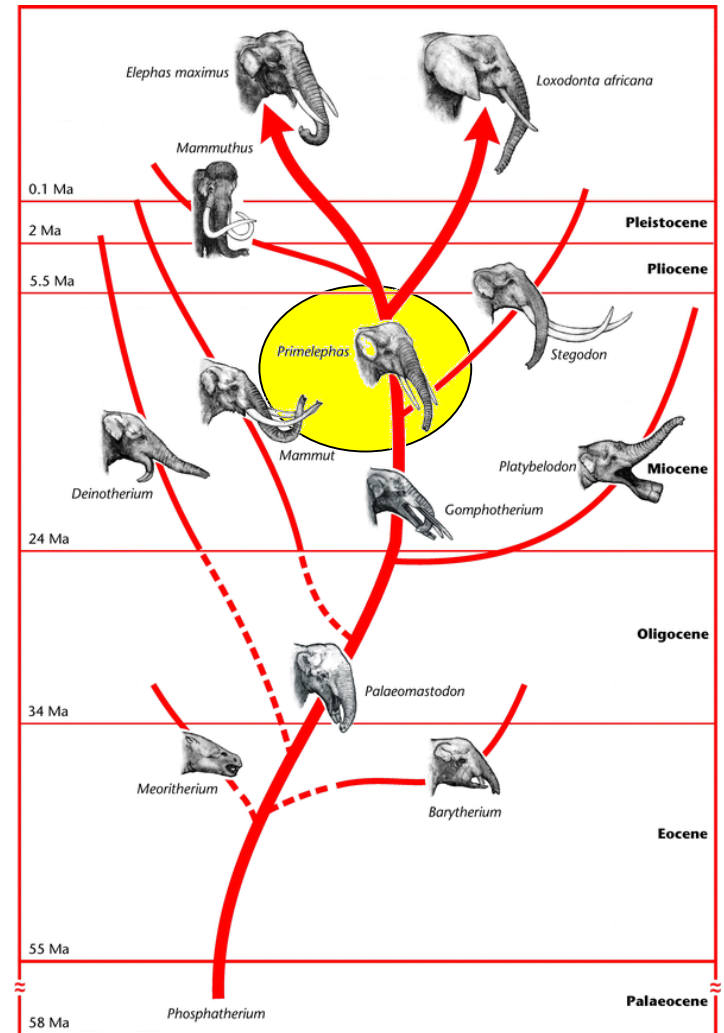
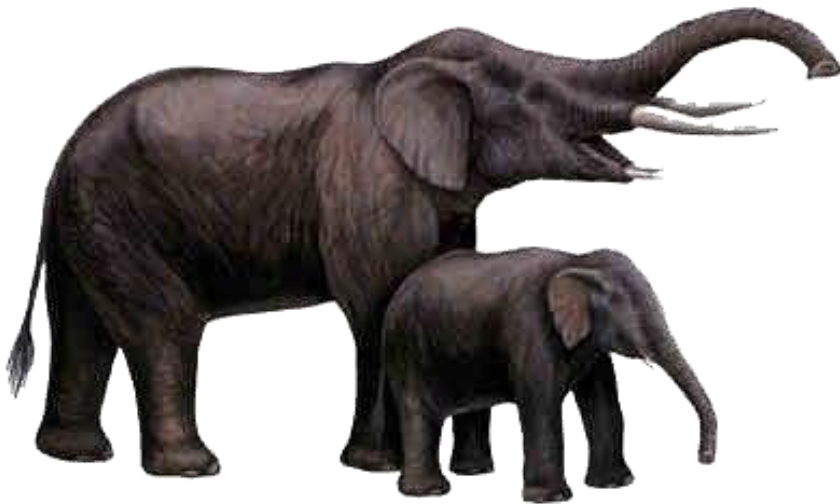
*Mammut*  
(Mastodonte Americano)

# Proboscidea (Paleoceno – Recente)

## Elephantidae (Mioceno-Recente) basais



*Primelephas*:  
Mioceno do Kenya





# **Carnivora** (Paleoceno – Recente)

“Falsos Dentes-de-Sabre”: *Barbourofelis*

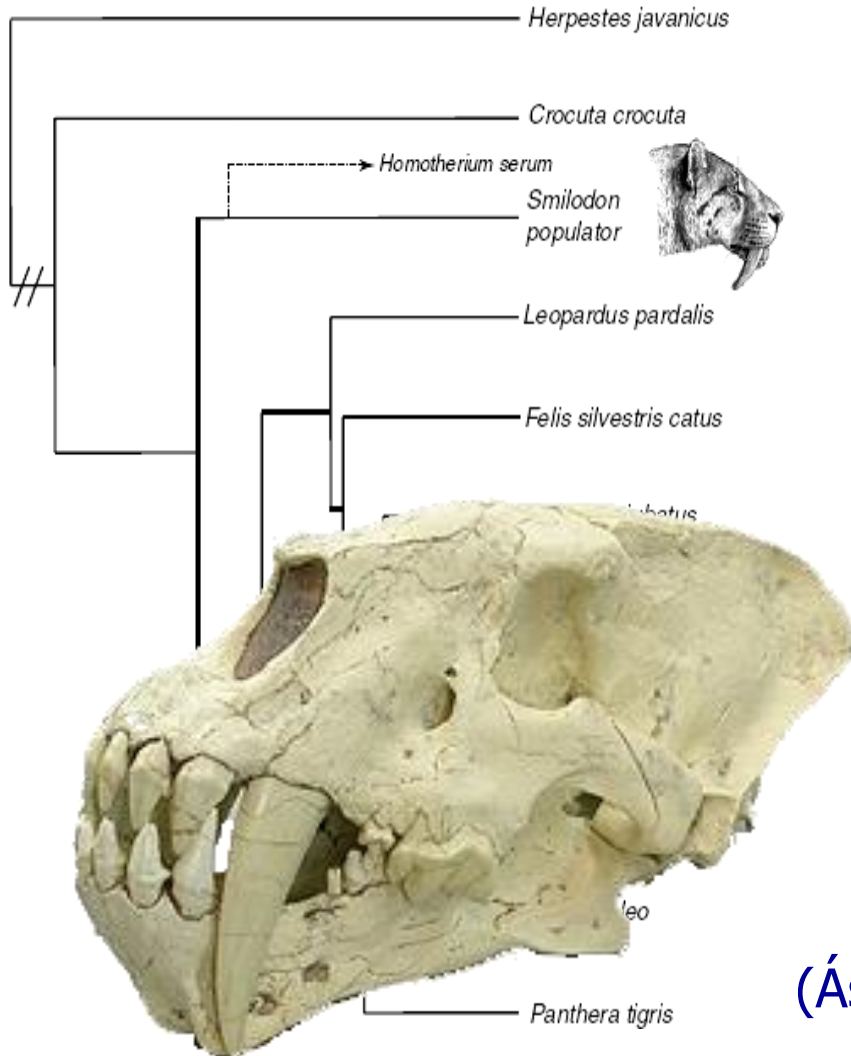
o maior “Dentes-de-Sabre” conhecido (Mioceno dos EUA)



# Carnivora (Paleoceno – Recente)

Felidae (Oligoceno - Recente): “Tigres-dente-de-sabre”

Machairodontidae: grupo irmão dos felinos vivos



*Homotherium* - Plioceno  
(Ásia, Europa, América do Norte e África)



# **Rodentia** (Cretáceo?, Paleoceno – Recente)

Mylagaulidae: afins ao “Castor Montês” (*Aplodontia*)

Formas cavadoras com chifres (Oligoceno-Plioceno da América do Norte)



*Epigaulus*

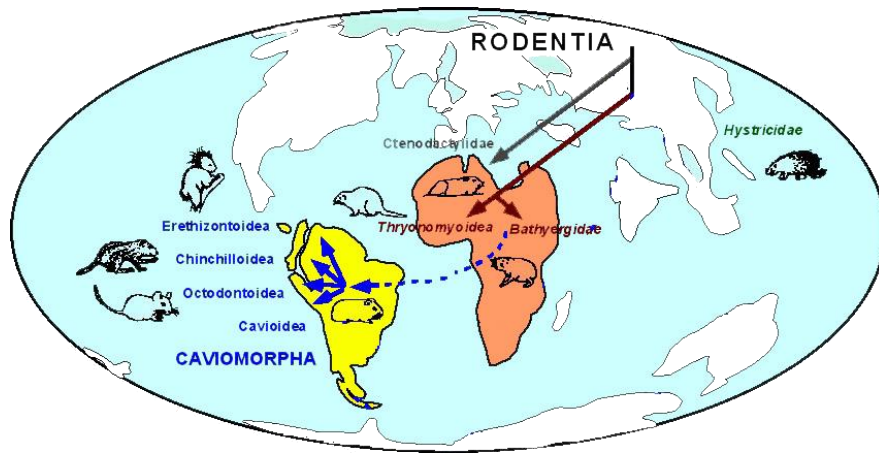


*Ceratogaulus*

# Rodentia (Cretáceo?, Paleoceno – Recente)

Caviomorpha (cavimorfa, rato-do-banhado, chinchila)

Invadiram a América do Sul pela África no Oligoceno



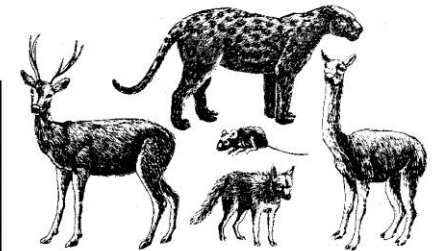
(a)



*Neopiblema* (Mioceno do Acre)

Millions of Years Ago

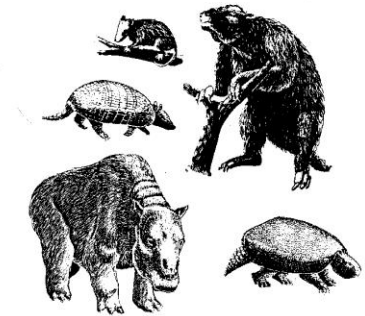
0	Pleistocene	Lujanian, Ensenadan, Uquian, Chapadmalalan	
5	Pliocene	Montehermosan, Huayquerian	
10	Miocene	?, Mayuan, Laventan	
15		Colloncuran, Santacrucian	
20		?, Colhuehupian, ?	
25		Oligocene	Deseadan
30			New LMA ('Tinguirrican')
35	Eocene	?, Divisaderan, ?	
40		?, Mustersan, ?	
45		?, Casamayoran, ?	
50		?, Riochican, Itaboraian	
55		?, 'Peligran', Tiupampian, ?	
60	Paleocene	?, ?	
65		?, ?	



Stratum 3: Northern invaders and the great American interchange



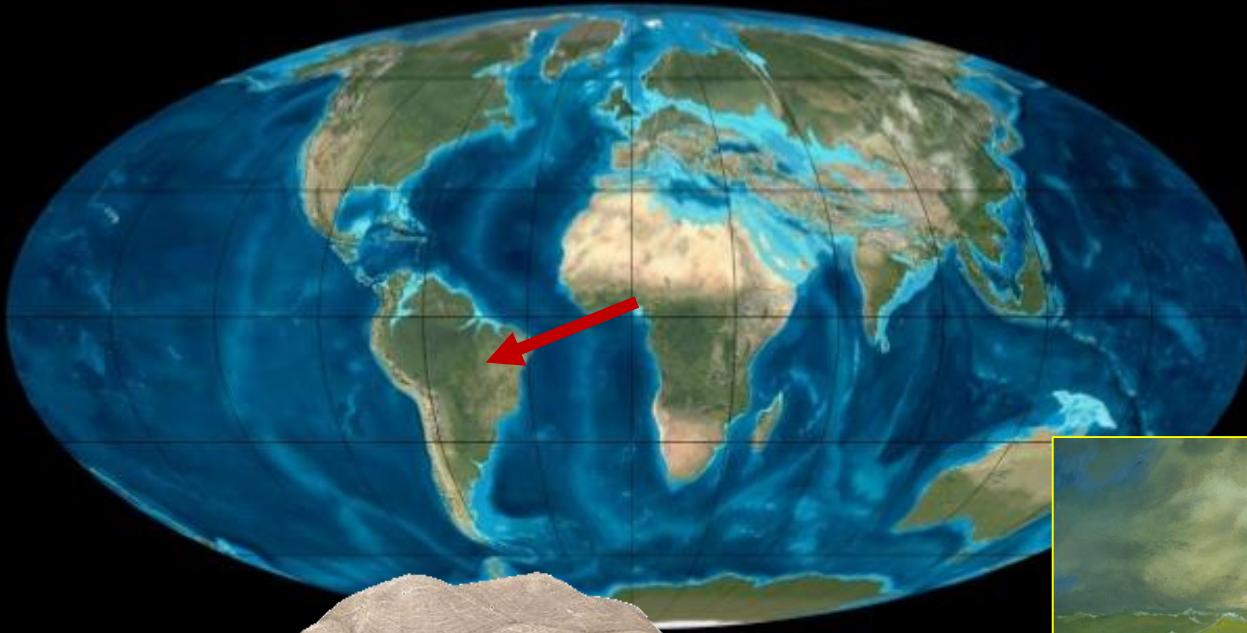
Stratum 2: Monkeys and rodents arrive, modernization of ancient lineages



Stratum 1: Archaic South American mammals

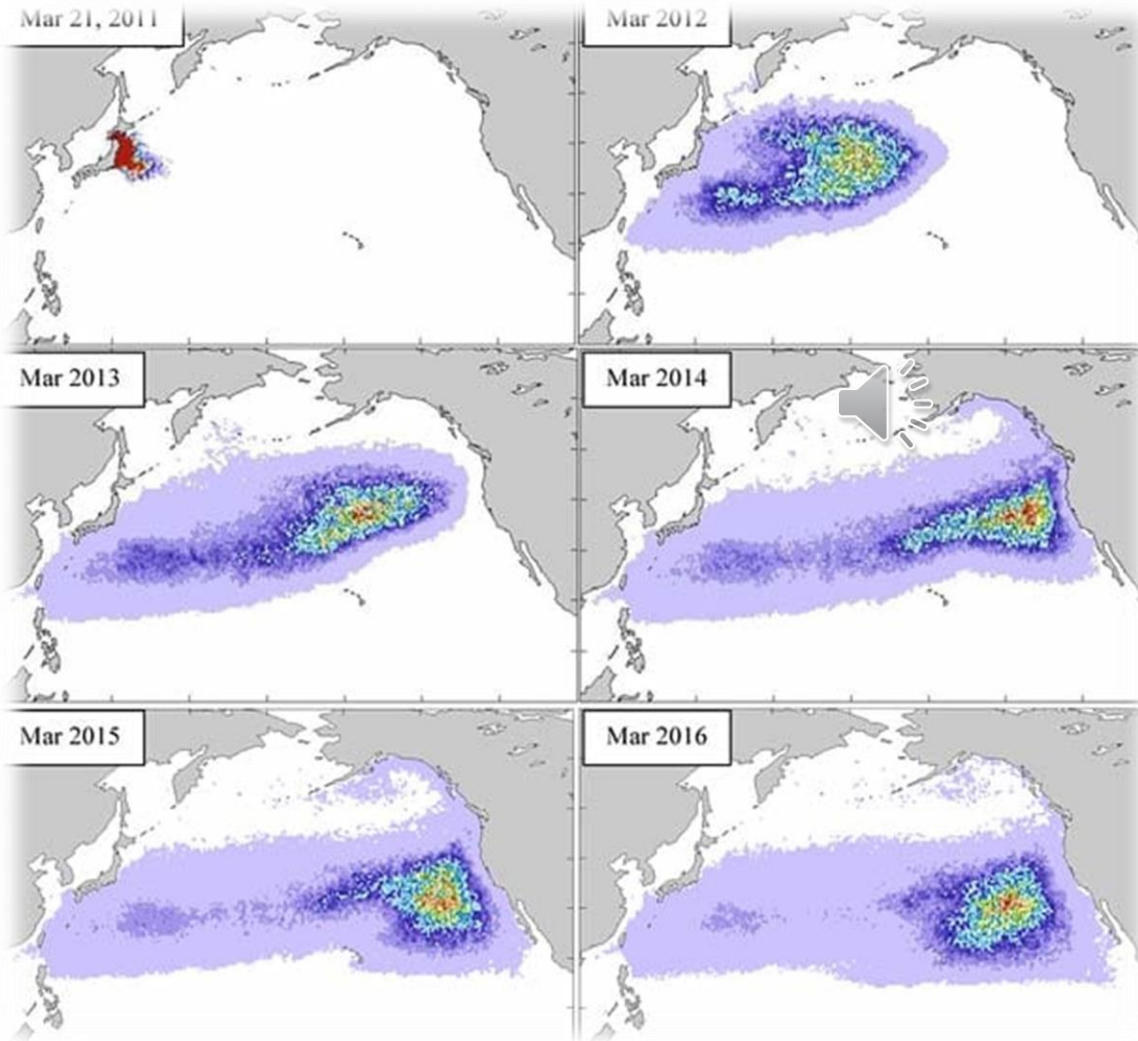
# Rafting

Invadiram a América do Sul pela África no Oligoceno



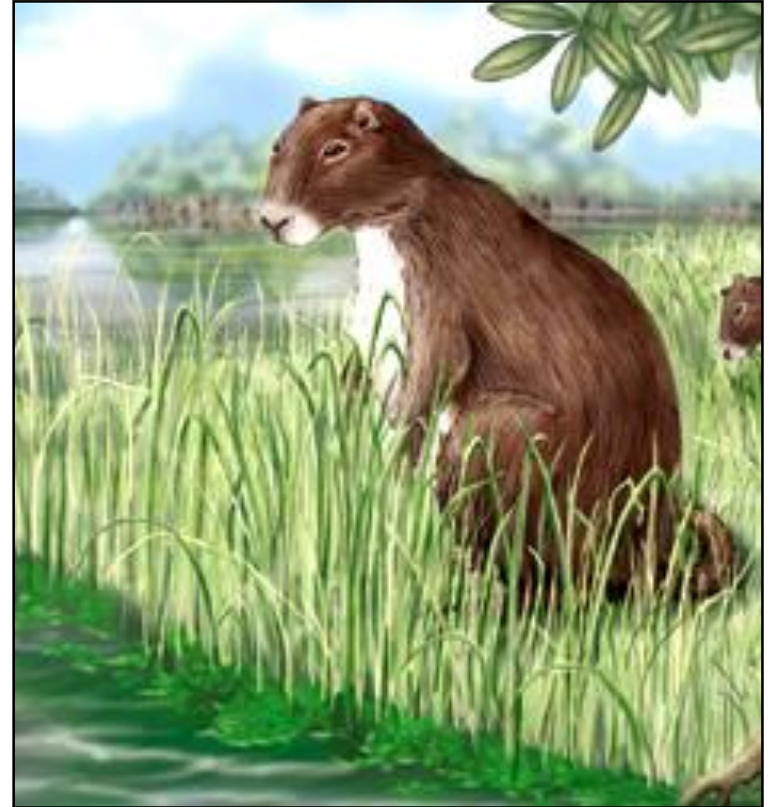
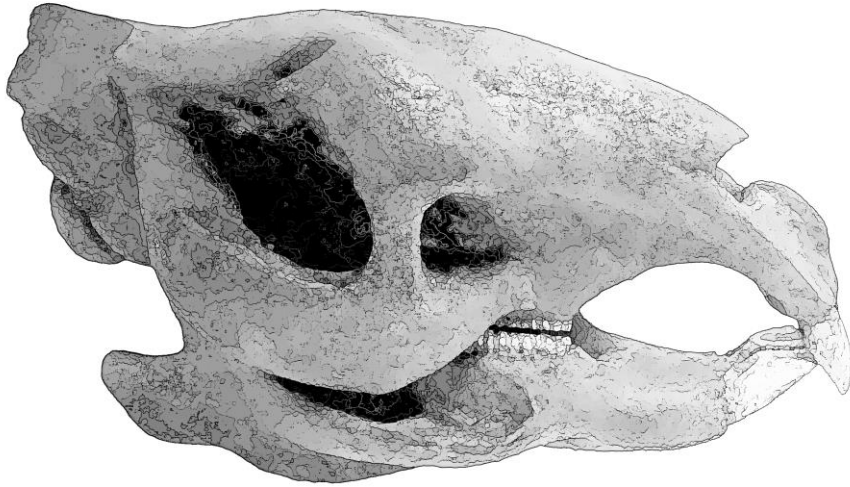
# Rafting

Invadiram a América do Sul pela África no Oligoceno



# Rodentia (Cretáceo?, Paleoceno – Recente)

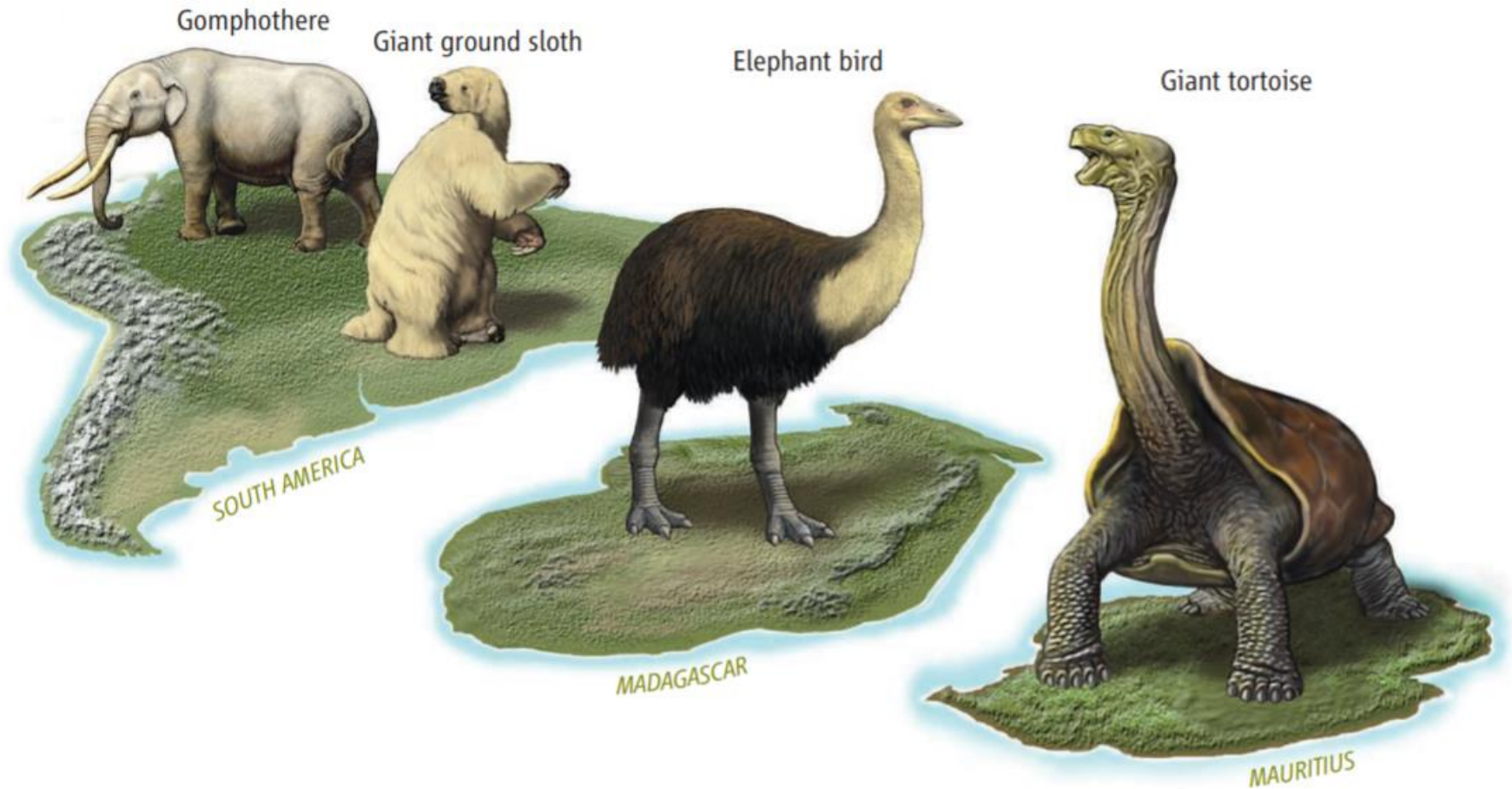
Caviomorpha: *Phoberomys* (Mioceno da Venezuela)



Afim à Pacarana: até 700 kg  
10 vezes maior que a capivara

# Quaternário (Pleistoceno-Holoceno) últimos 2,5 Ma

Megafauna: animais terrestres de grande porte

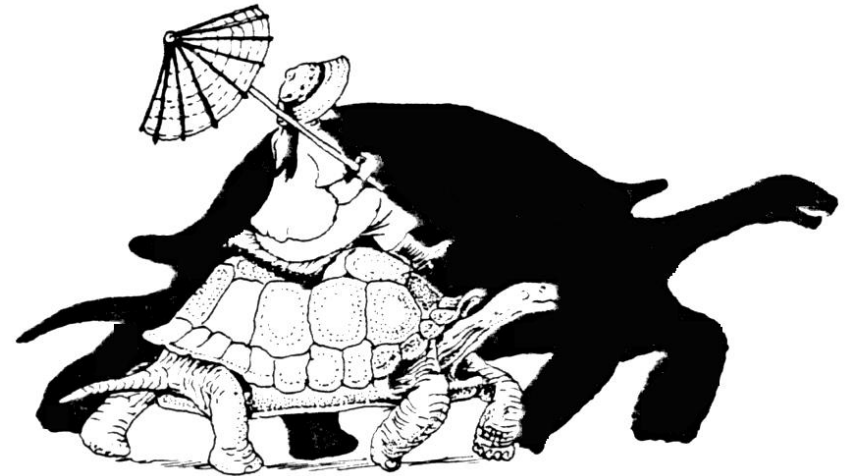


# Cryptodira (Jurássico inf. - Recente)

Testudinidae (Paleoceno - Recente)

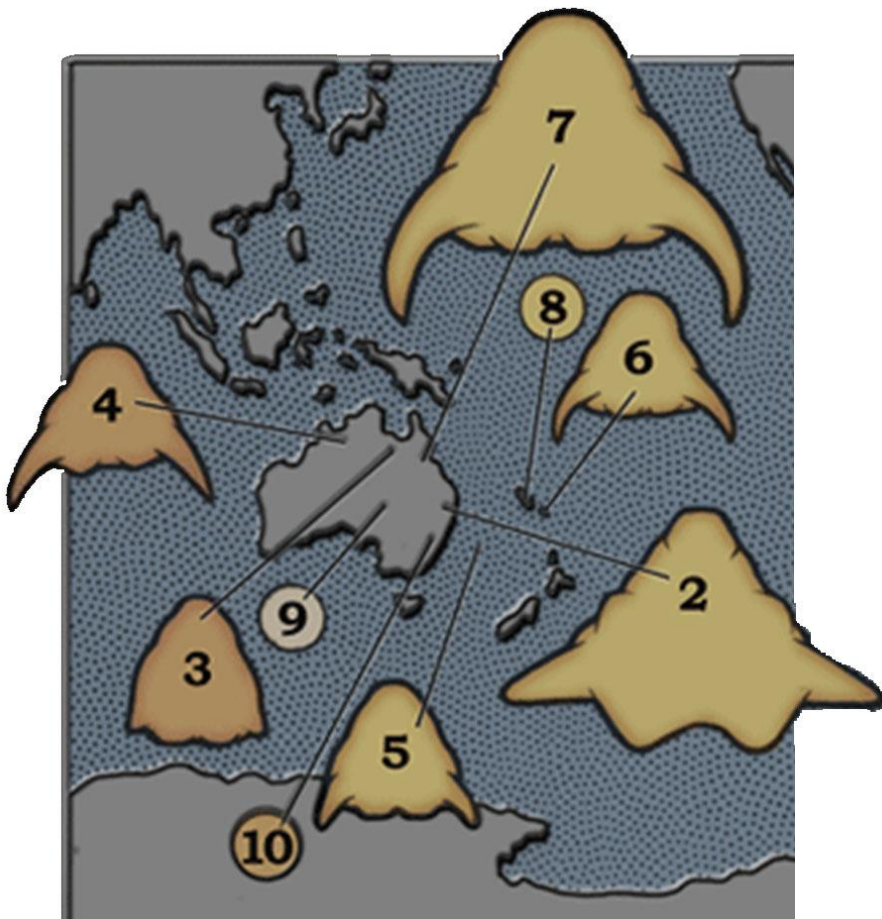
## *Colossochelys*

Pleistoceno da Índia (1,5 m de altura e 2,1 de carapaça)



# Cryptodira (Jurássico inf. - Recente)

Meiolanidae: conviveu com o homem em Vanuatu

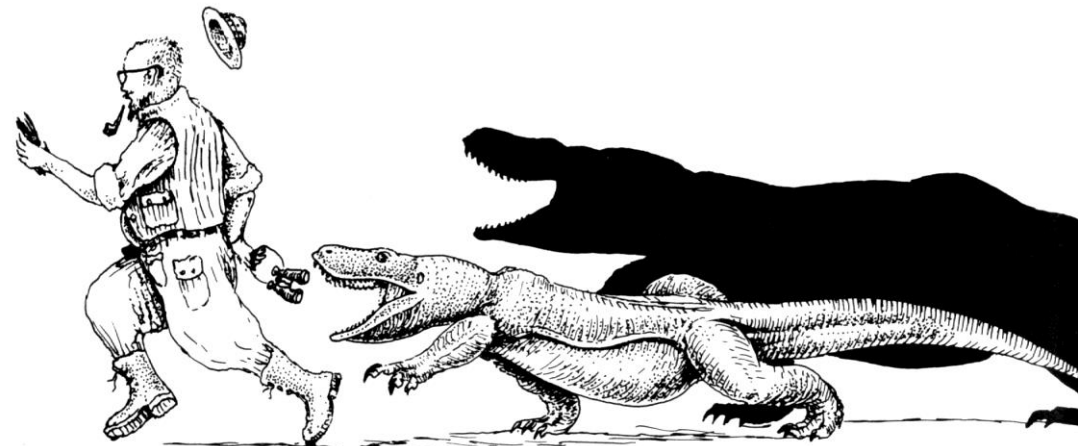
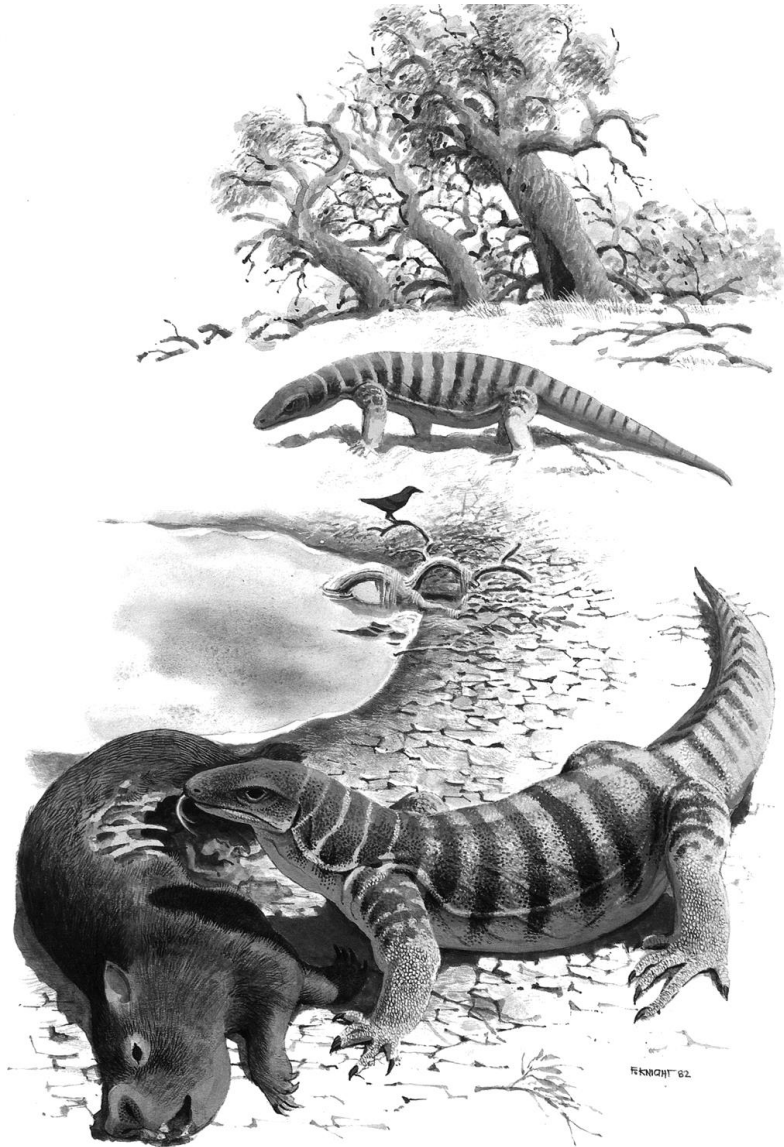


*Meiolania*  
Pleistoceno da Austrália

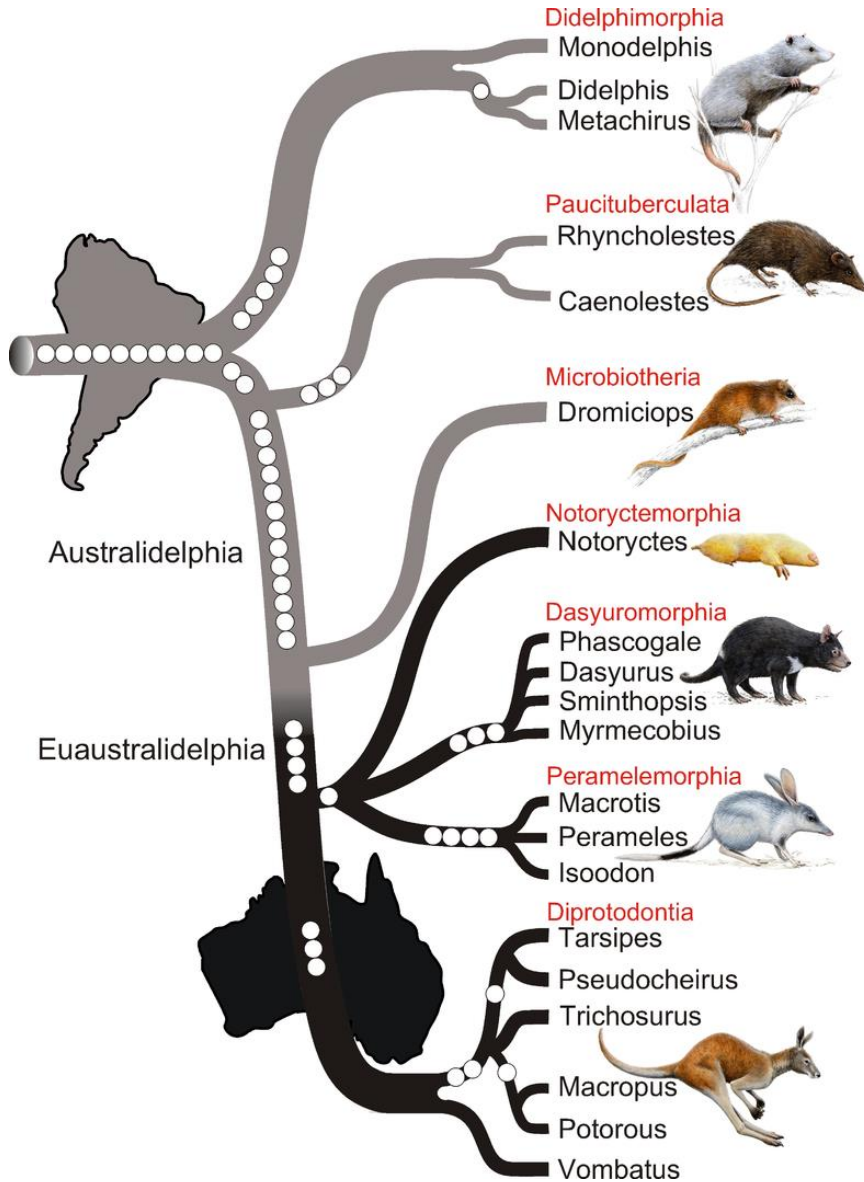


# Varanidae - *Megalania prisca*

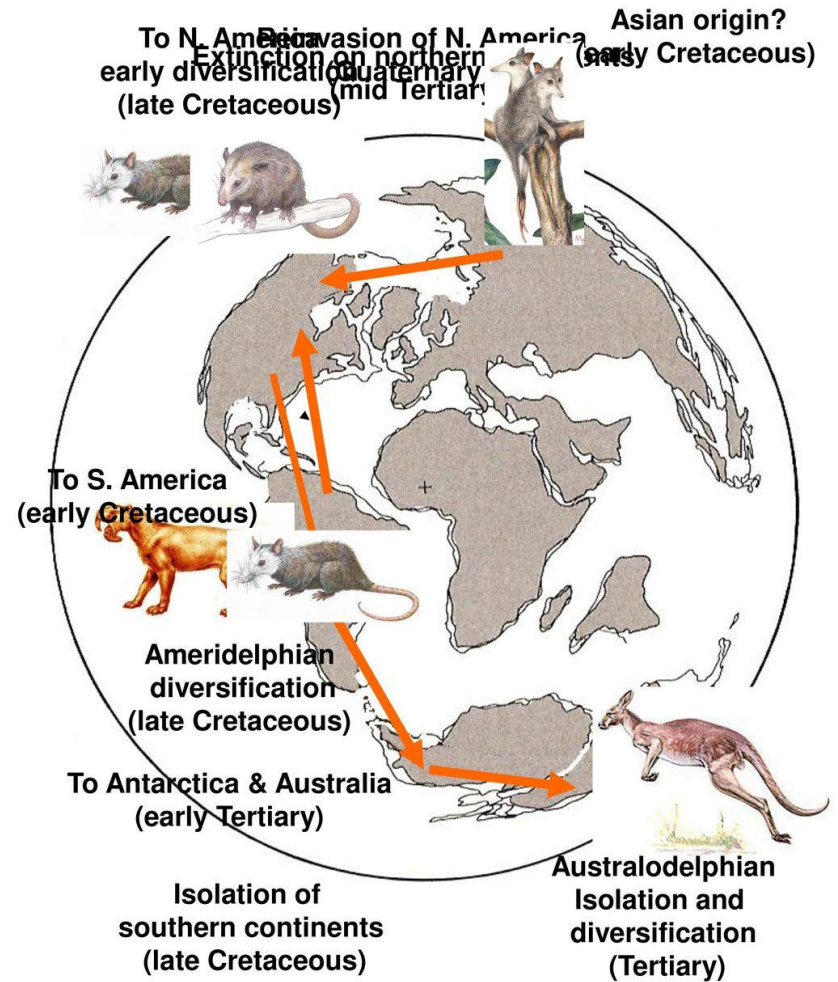
varanídeo de 7 m e e 600 kg do Pleistoceno da Austrália



# "Australidelphia" (Paleoceno – Recente)



## MARSUPIAL BIOGEOGRAPHY



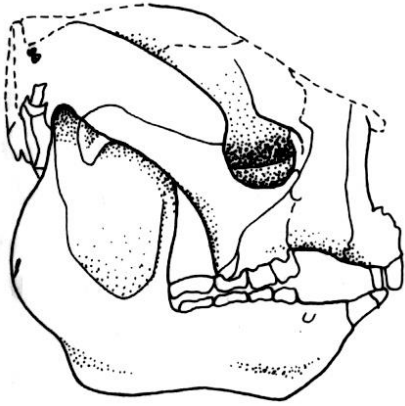
# “Australidelphia” (Paleoceno – Recente)

*Thylacoleo* (predador com crânio de 25 cm)



# "Australidelphia" (Paleoceno – Recente)

Phalangeriformes: inclui *Cangurus gigantes*

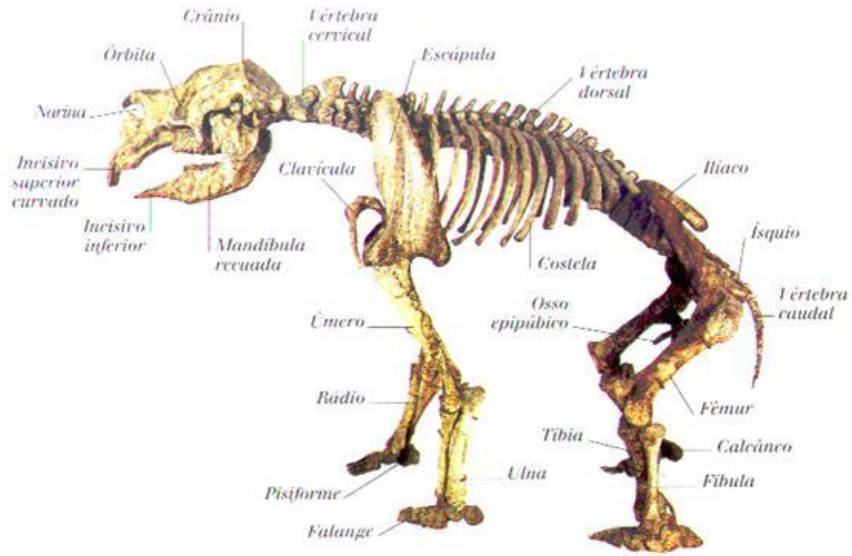


*Procoptodon*



# “Australidelphia” (Paleoceno – Recente)

Vombatiformes: inclui “vombates” *Diprotodon* e *Neohelus*

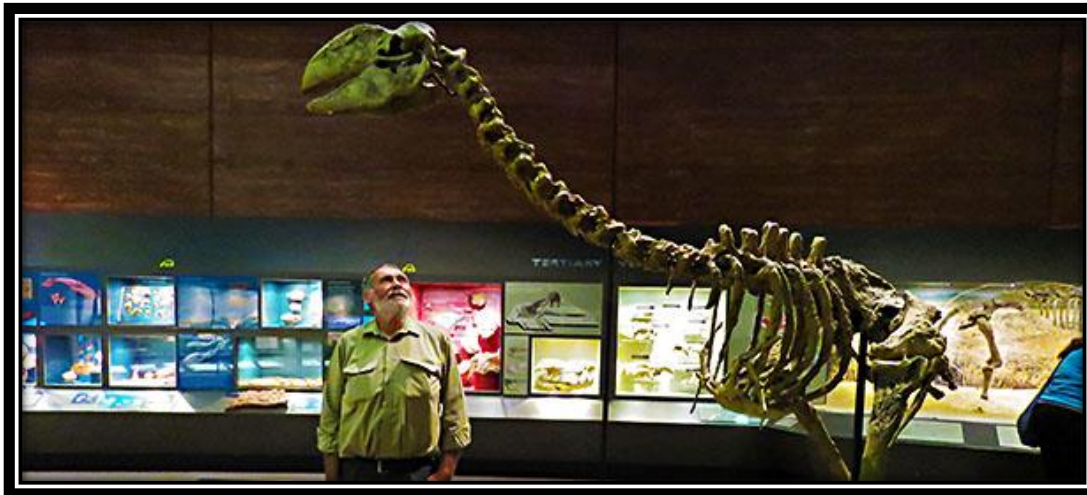
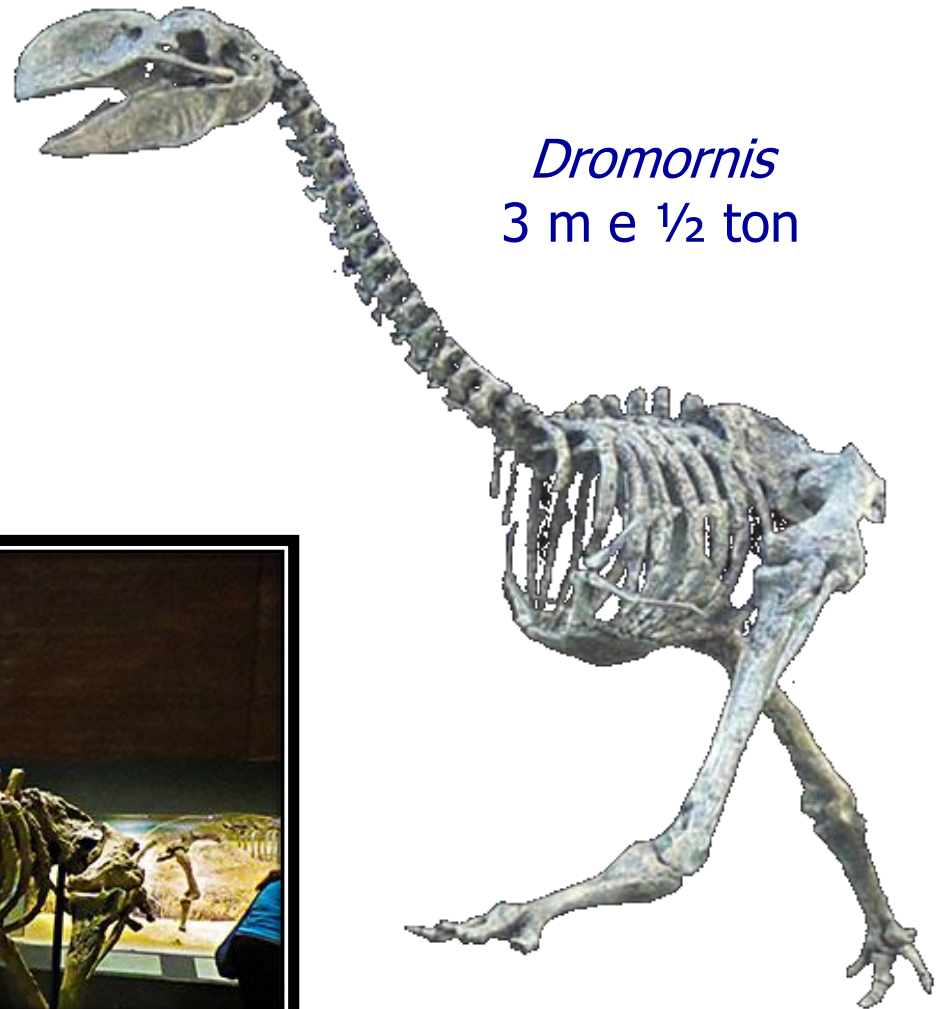


*Diprotodon*

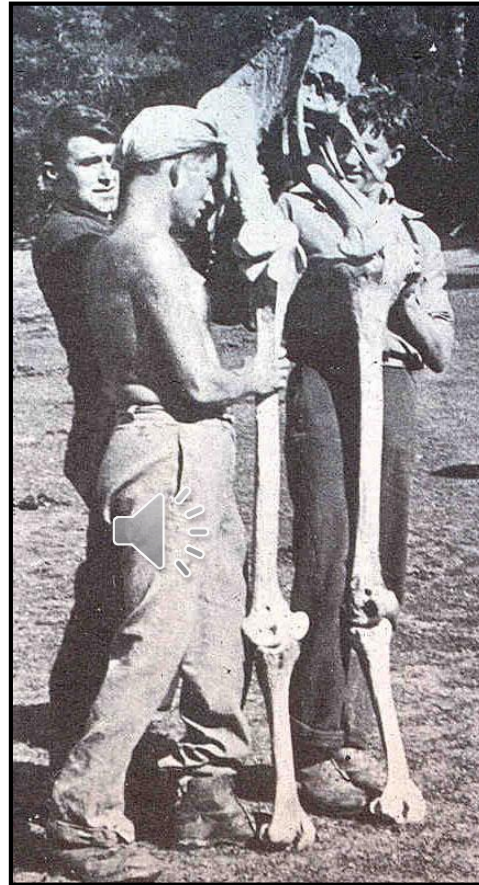
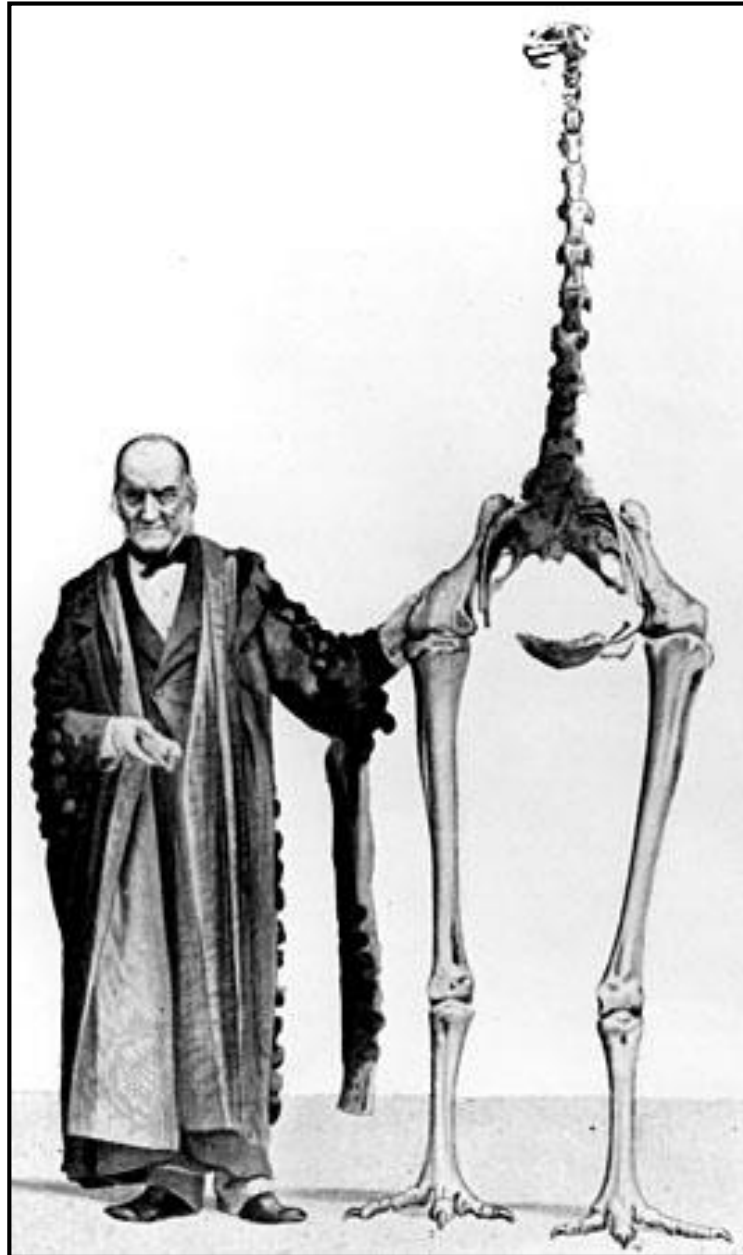


# Galloanserae

Dromornithidae (Oligoceno-Pleistoceno da Austrália) - "Mihirung"



# Ratites (Paleoceno - Recente) - inclui algumas das maiores aves

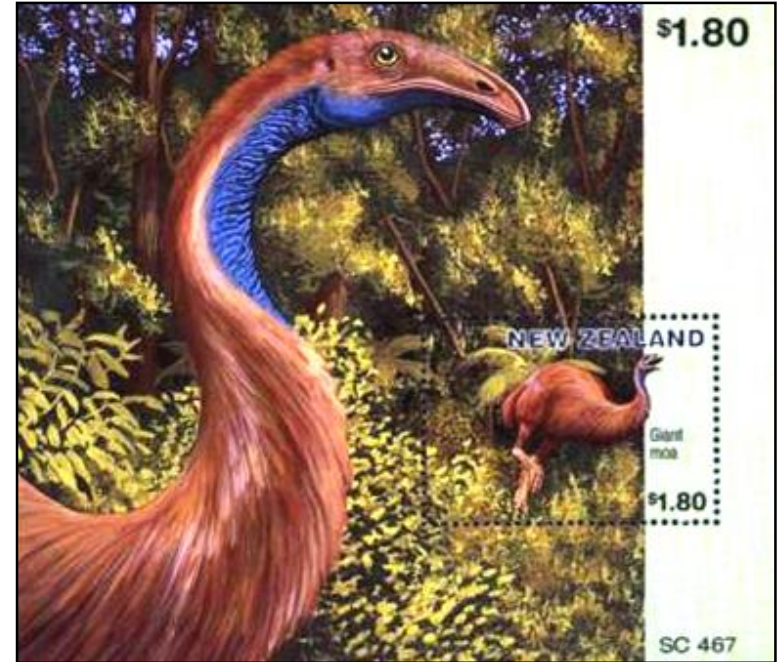
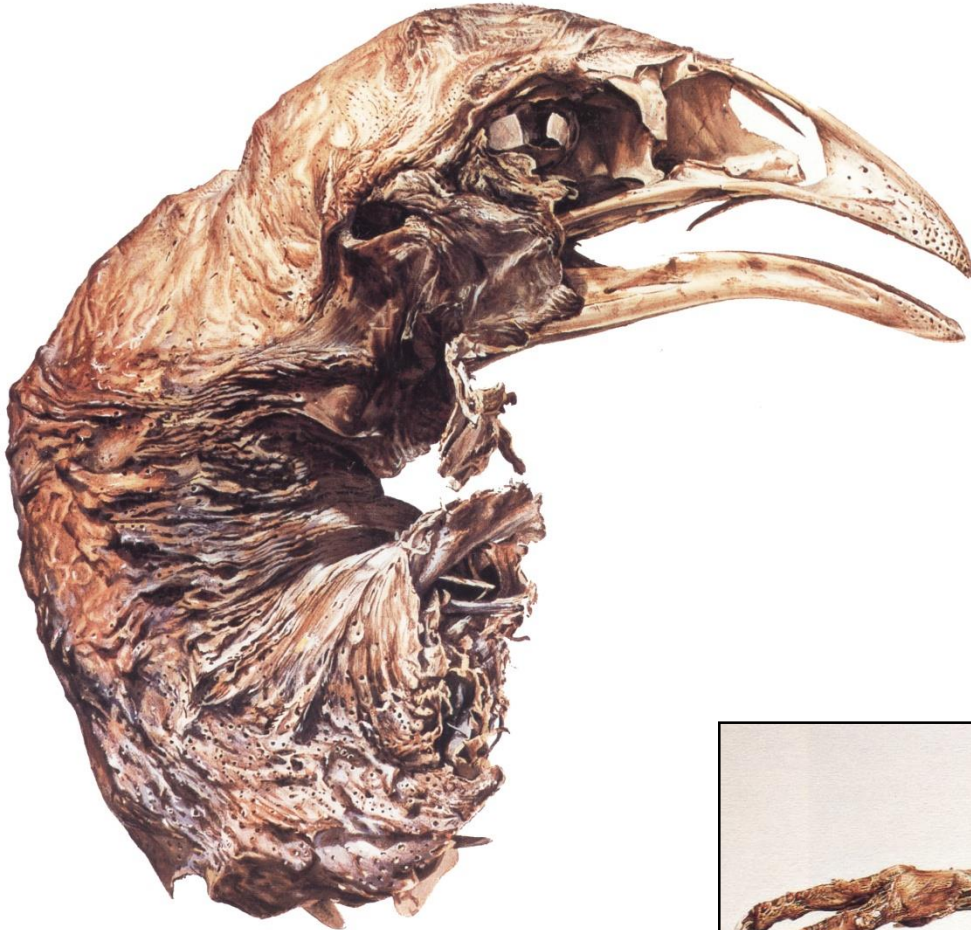


*Dinornis maximus*  
Pleistoceno-Holoceno  
Nova Zelândia



# Ratites (Paleoceno - Recente)

Moas: aves florestais (habitat semelhante ao do Casuar)



Preservação por  
mumificação em cavernas

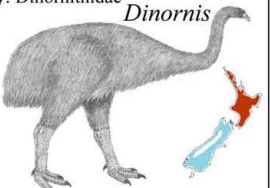




# Ratites (Paleoceno - Recente)

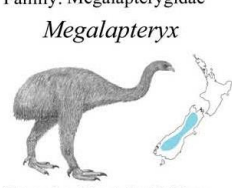
Moas: 11 espécie/6 gêneros (tamanho varia do de um peru a mais de até 3 m)

**Family: Dinornithidae**  
*Dinornis*

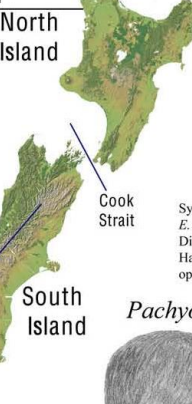


**Systematics:** Two species *D. robustus* (South Island, blue) and *D. novaezealandiae* (North Island, red)  
**Dimensions:** 56-249 kg and 90 to 200 cm in height - significant sexual dimorphism with females up to three times the mass of males.  
**Habitat:** Browsing generalist - has been found in upland, lowland and open forest habitats. The larger forms occupied low rainfall areas.

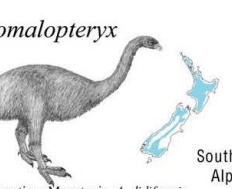
**Family: Megalapterygidae**  
*Megalapteryx*



**Systematics:** Monotypic, *M. didimus*, (South Island).  
**Dimensions:** 28-80 kg and 65 to 95 cm.  
**Pleistocene specimens** are significantly larger than Holocene forms.  
**Habitat:** Subalpine scrub, grassland and high country forests (usually >900m).

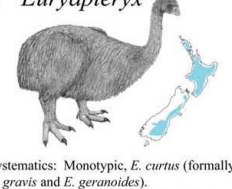


**Family: Emeidae**  
*Anomalopteryx*



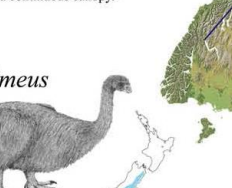
**Systematics:** Monotypic, *A. didiformis*.  
**Dimensions:** 26-64 kg and 50 to 90 cm.  
**Habitat:** Non-coastal lowland forests with a continuous canopy.

*Euryapteryx*



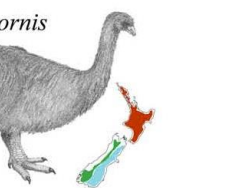
**Systematics:** Monotypic, *E. curtus* (formally *E. gravis* and *E. geranoides*).  
**Dimensions:** 12-109 kg and 51 to 103 cm.  
**Habitat:** Drier climates - typically lowland open forest and coastal sites.

*Emeus*

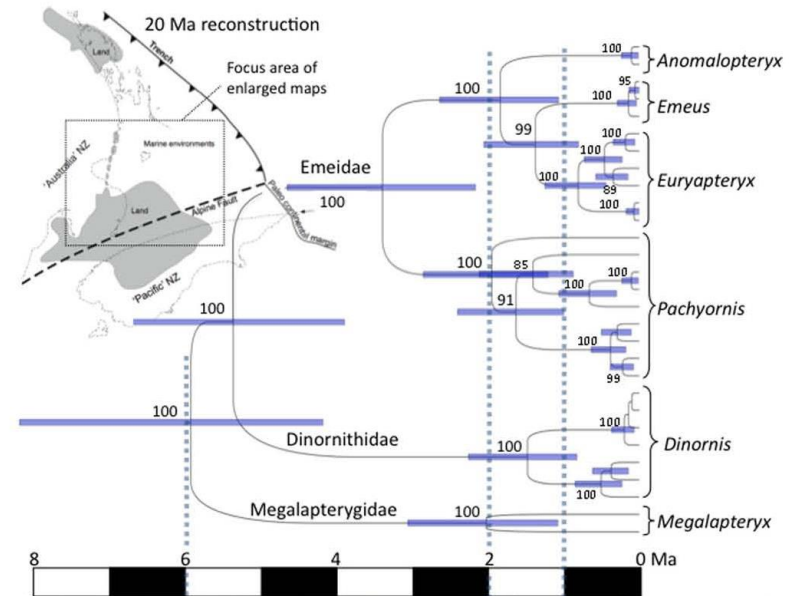


**Systematics:** Monotypic, *E. crassus*, (South Island).  
**Dimensions:** 36-79 kg and 73 to 99 cm in height.  
**Habitat:** Preference for lowland forest (usually <200m) and swamps.

*Pachyornis*



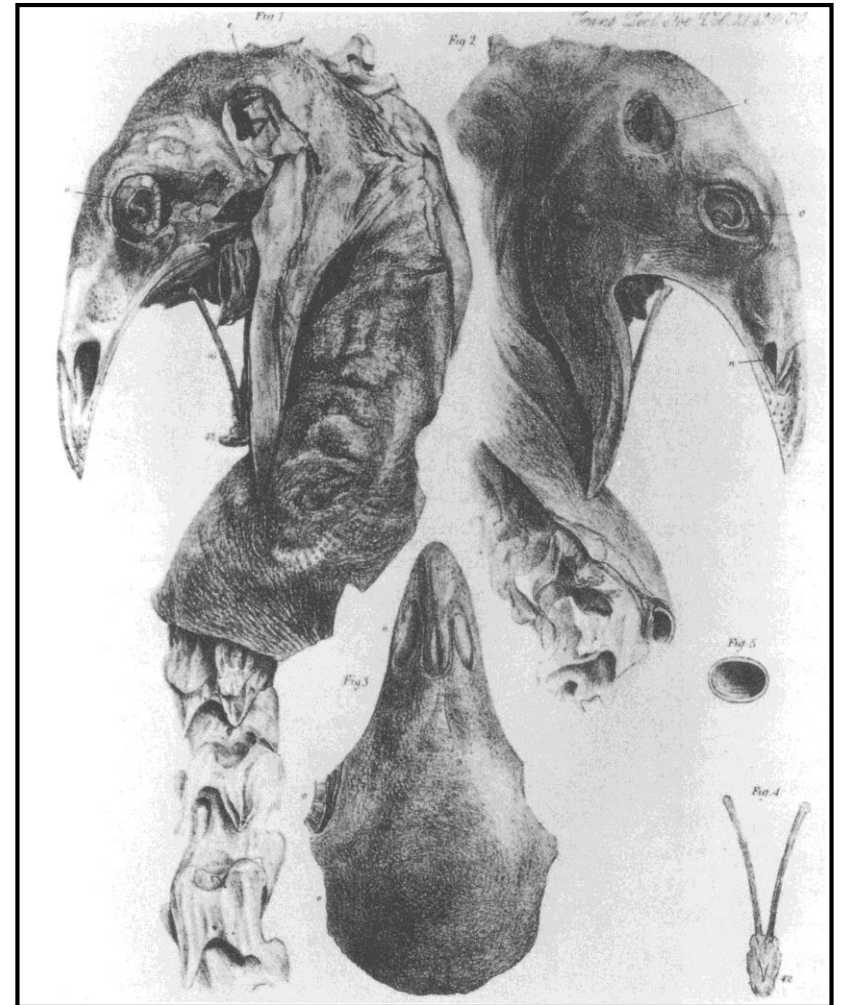
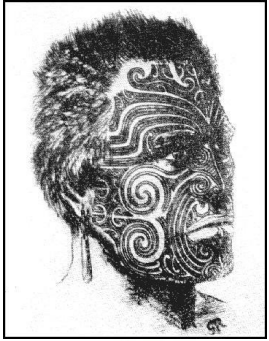
**Systematics:** *P. geranoides* (North Island), *P. elephantopus* (blue) and *P. australis* (green) (South Island).  
**Dimensions:** 17-163 kg and 54 to 121 cm in height.  
**Habitat:** *P. australis* occupied subalpine grassland, *P. geranoides* and *P. elephantopus* preferred lowland forest edges and wetland vegetation.



Filogenia molecular com DNA mitocondrial de mais de 250 subfósseis sugere separação entre faunas do sul e do norte de mais de 30 Ma

# Ratites (Paleoceno - Recente)

Moa: extintos à 300 anos pela colonização das ilhas pelos Maori

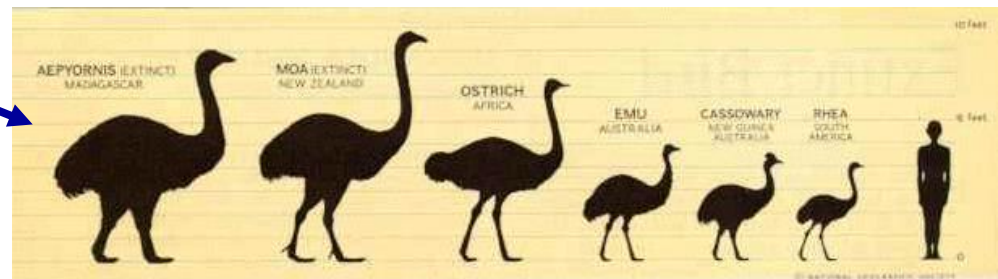
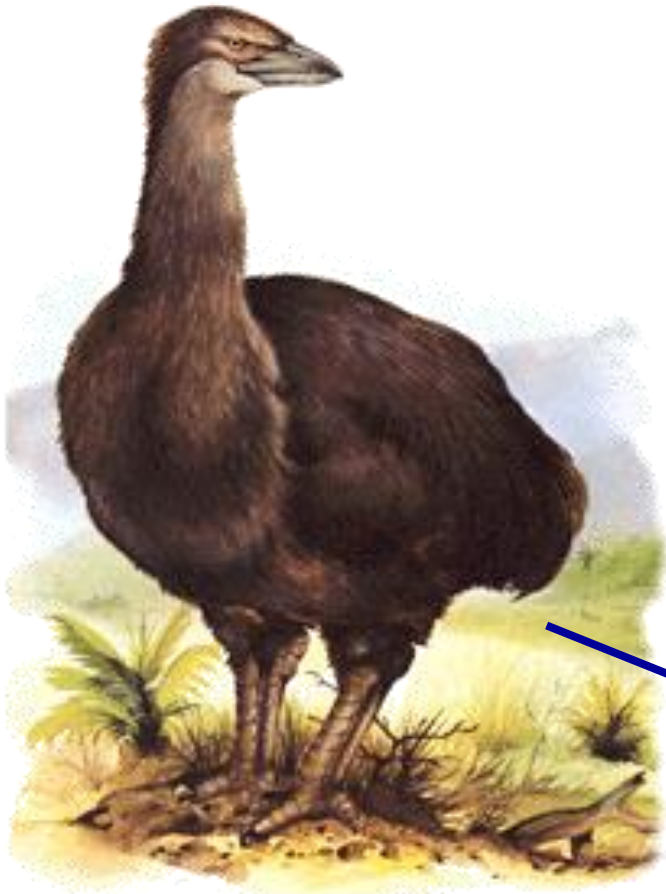


# Ratites (Paleoceno - Recente)

*Aepyornis maximus*: Vorompatra ou "Pássaro-Elefante"

Mais pesada ave conhecida: aprox. 1/2 tonelada

Holoceno de Madagascar



## **Ratites** (Paleoceno - Recente)

*Aepyornis maximus*: Vorompatra ou "Pássaro-Elefante"

Mais pesada ave conhecida: aprox. 1/2 tonelada



# Megafauna africana

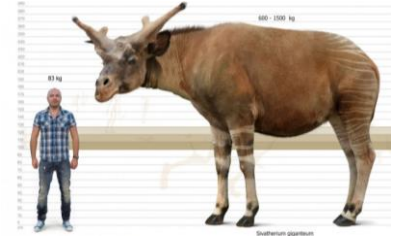
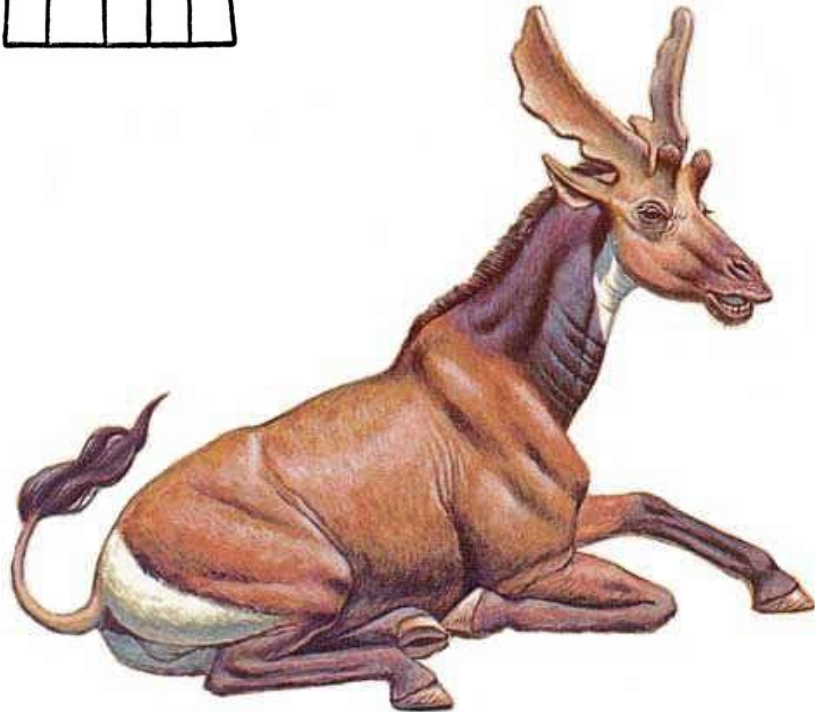


*Pelorovis*: corno com  
4 m de envergadura  
Pleistoceno do Quênia

# Artiodactyla: *Sivatherium* (Pleistoceno da África e Ásia)



Set



# Quaternário (Pleistoceno-Holoceno) últimos 2,5 Ma

Nove ciclos glaciais nos últimos 750 mil anos

Fauna adaptada no hemisfério norte

Last Glacial Maximum 18,000 years ago



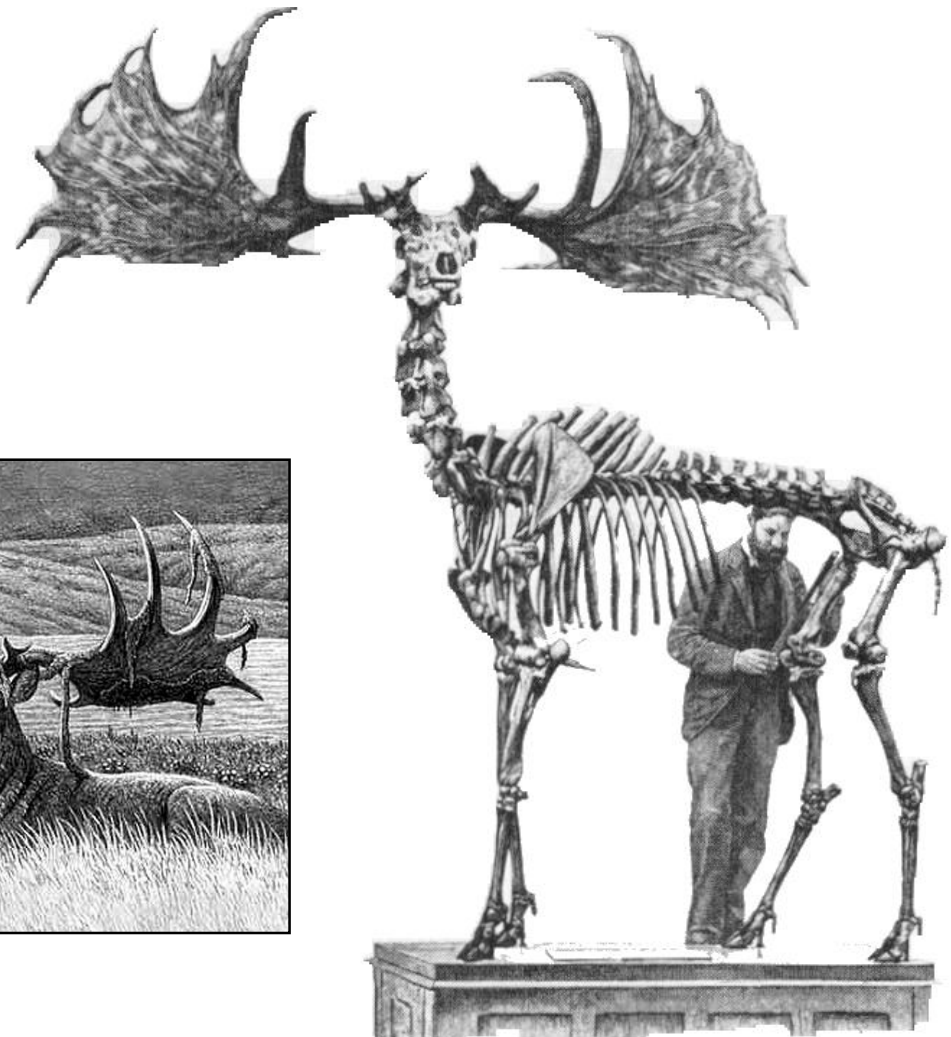
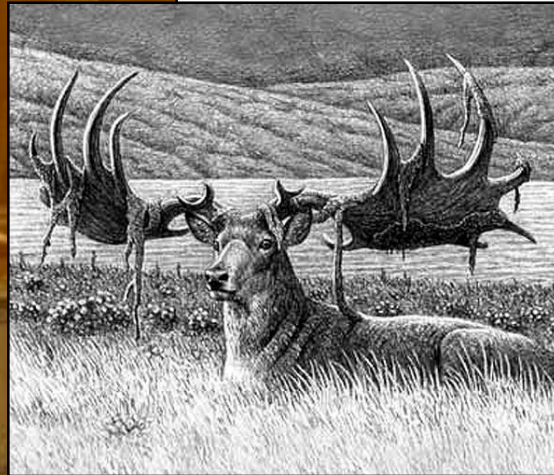
- Ancient Landmass
- Modern Landmass
- Subduction Zone (triangles point in the direction of subduction)
- Sea Floor Spreading Ridge

© 1995 C. K. Nelson, THESCOPE Press

# **Cervidae** (Mioceno-Recente)

*Megaloceros* "Giant Irish Elk" (Norte da Eurásia)

Cervo (não alce) com chifres com envergadura de 3.5 m





# **Perissodactyla** (Eoceno – Recente)

Rhinocerotidae (Eoceno – Recente)

Formas peludas do Pleistoceno da Sibéria

*Coelodonta* (afim a táxons viventes)



# **Perissodactyla** (Eoceno – Recente)

*Elasmotherium*

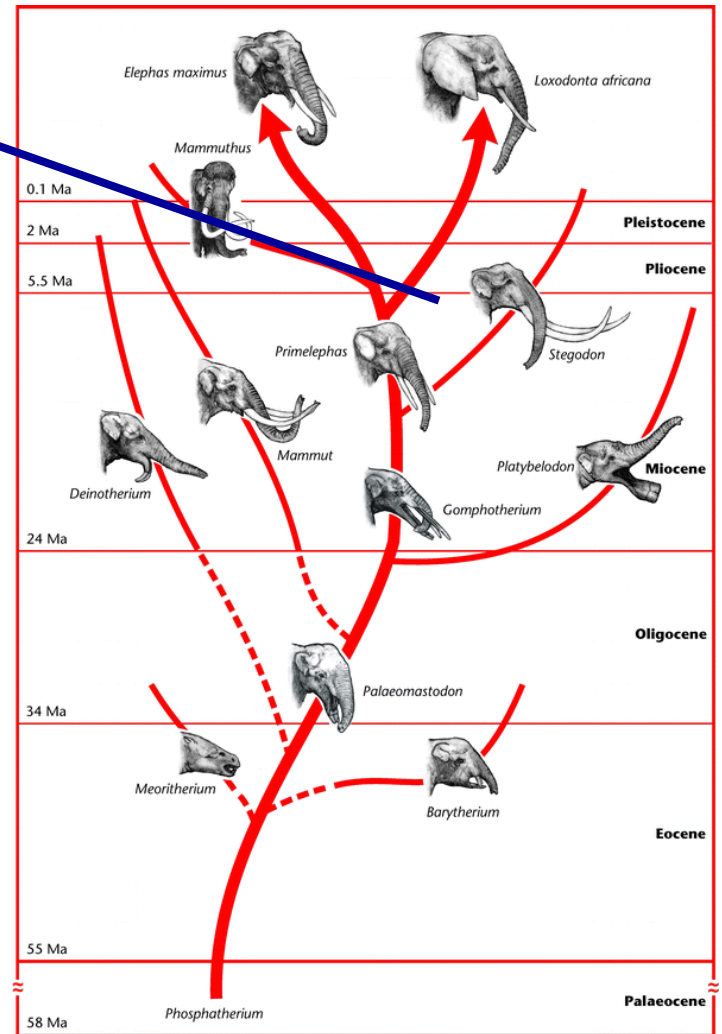
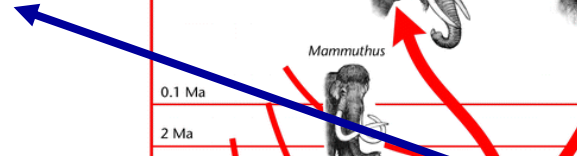


# Proboscidea (Paleoceno – Recente)

Elephantidae (Mioceno-Recente) basais

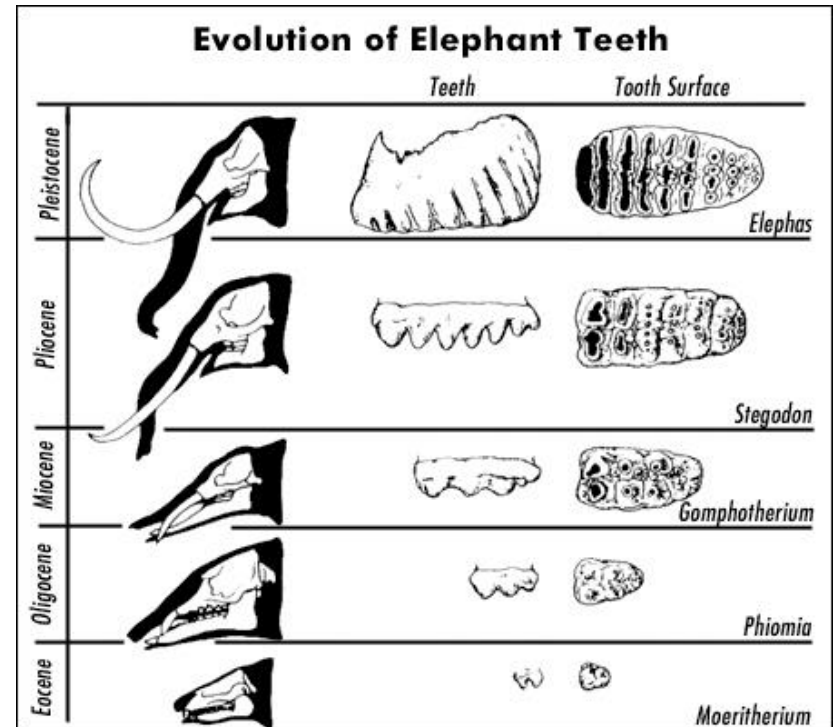
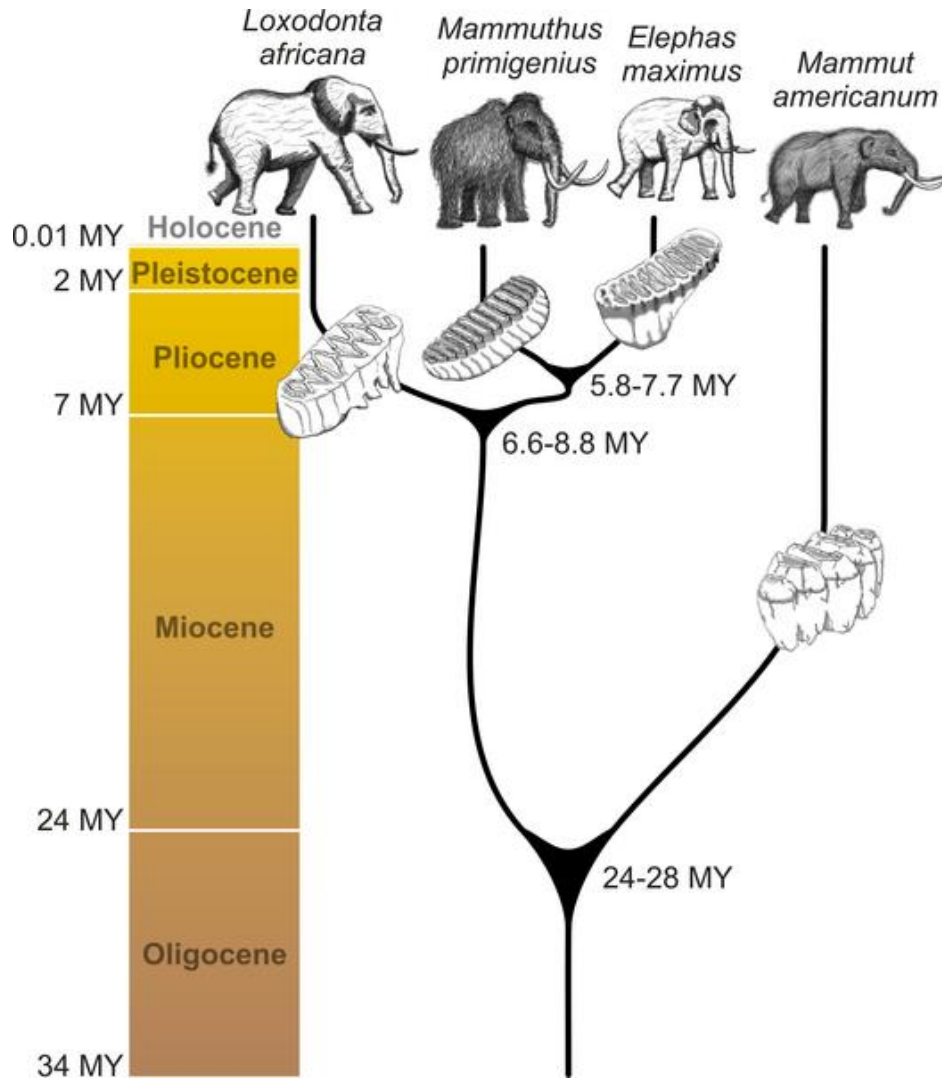


*Stegodon:*  
Plio-Pleistoceno  
Europa



# Proboscidea (Paleoceno – Recente)

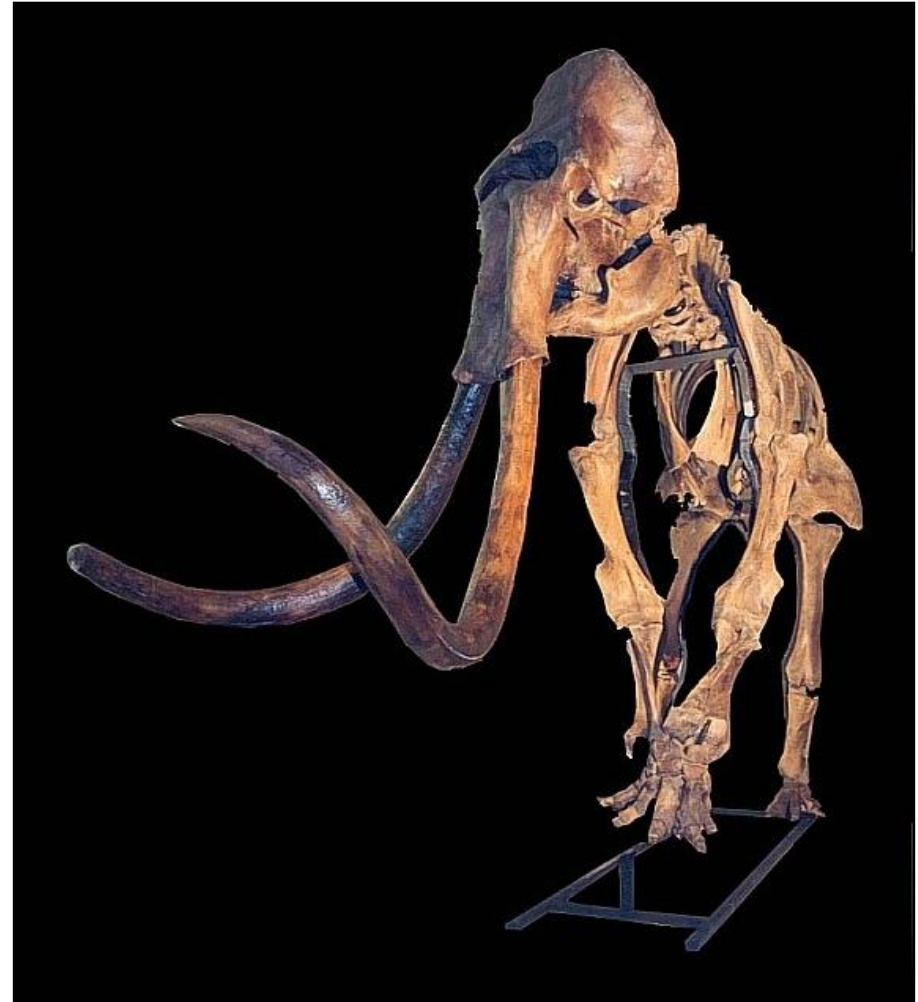
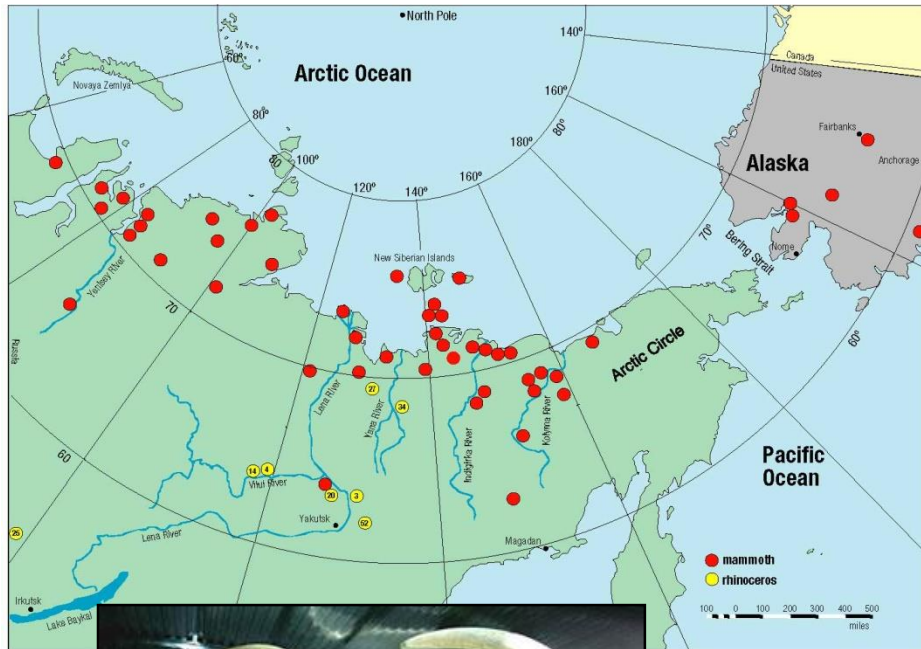
## Elephantidae (Mioceno-Recente) basais



# Proboscidea (Paleoceno – Recente)

## *Mammuthus* (Plio-Pleistoceno)

Plio-Pleistoceno da África e Pleistoceno glacial da Eurásia e América do Norte  
Gigantescos (4.5 m da altura e 5 m de presas) extintos junto com megafauna



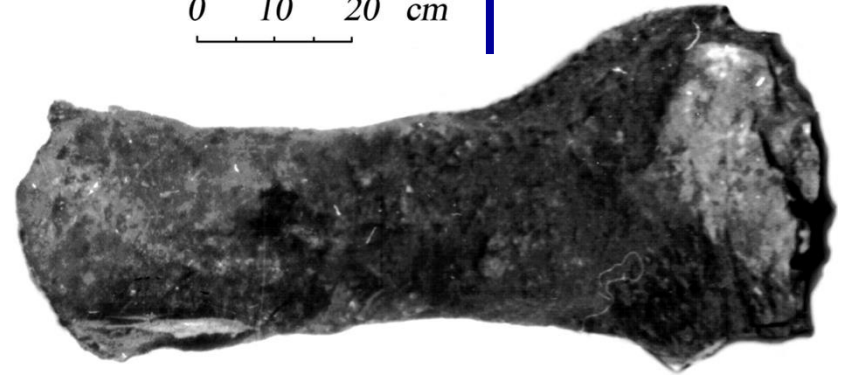
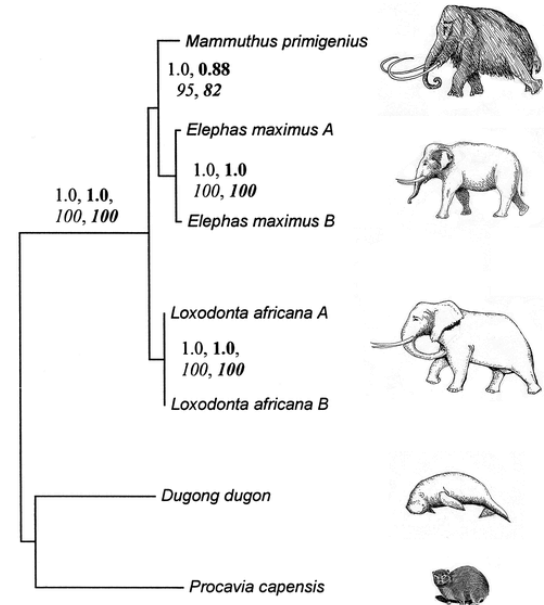
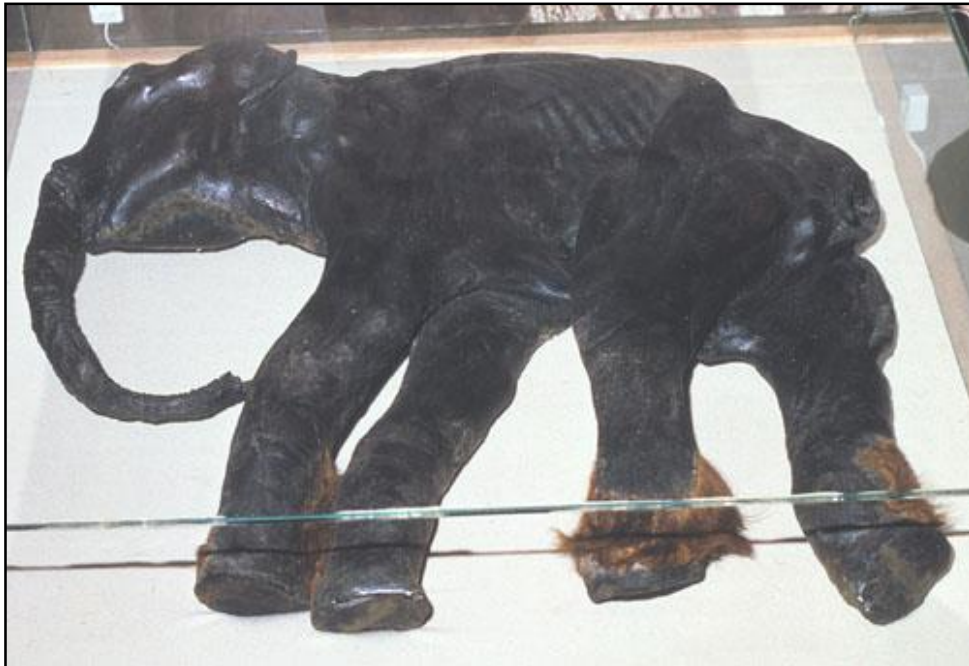
**Proboscidea** (Paleoceno – Recente)  
*Mammuthus* (Plio-Pleistoceno) - Beresovka



# Proboscidea (Paleoceno – Recente)

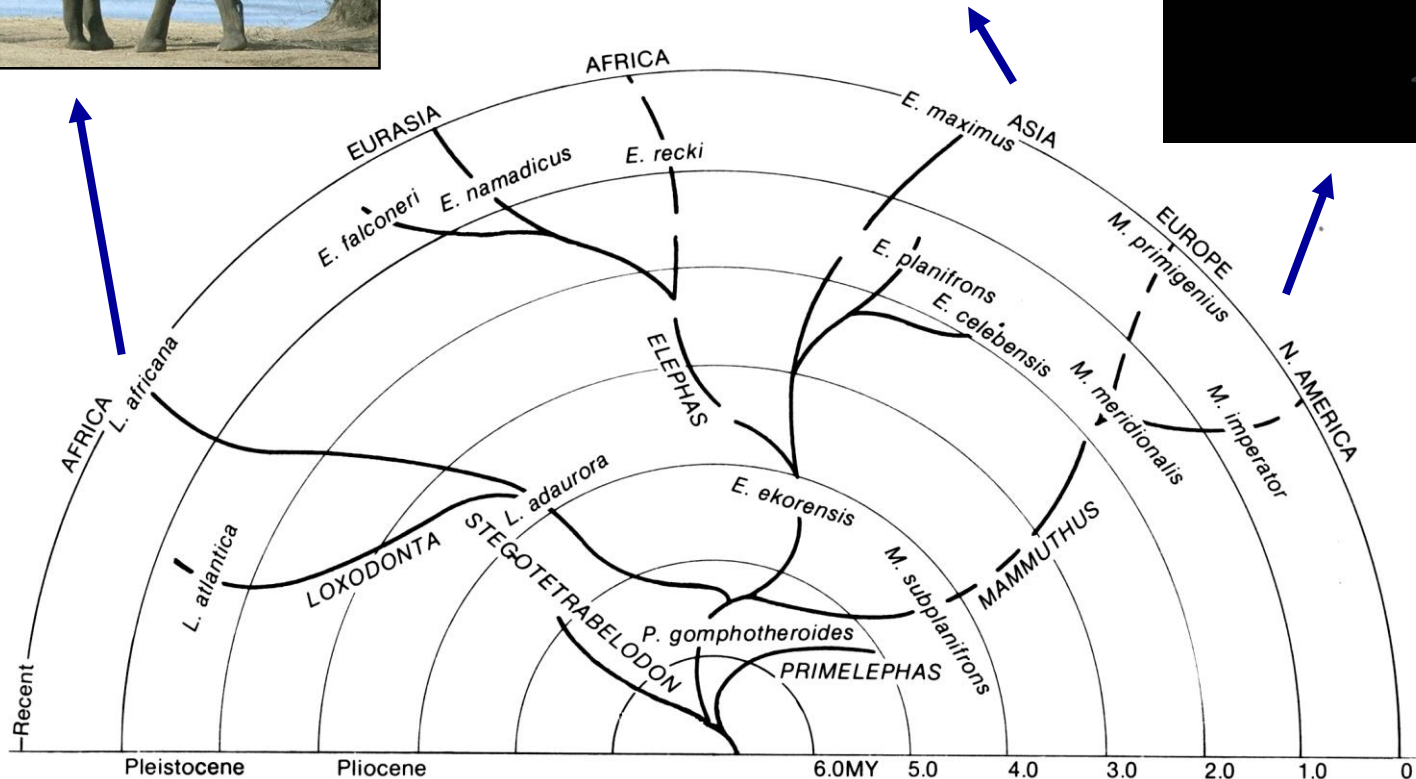
## *Mammuthus* (Plio-Pleistoceno)

Fossilização por criopreservação e preservação de material genético



# Proboscidea (Paleoceno – Recente)

*Loxodonta*: táxon irmão de *Elephas* e *Mammuthus*

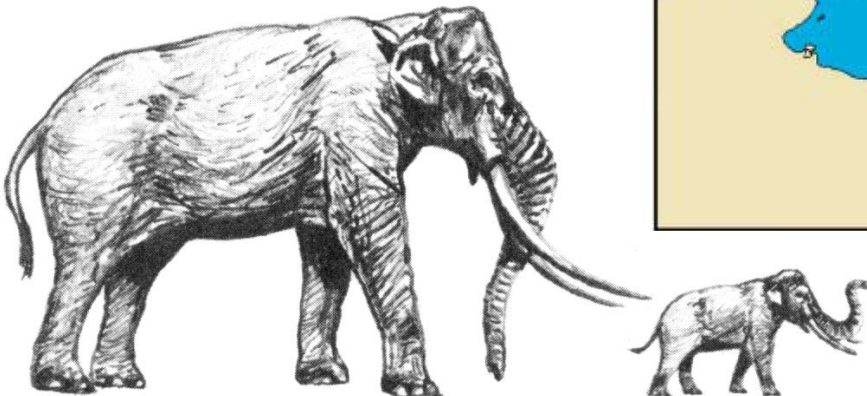
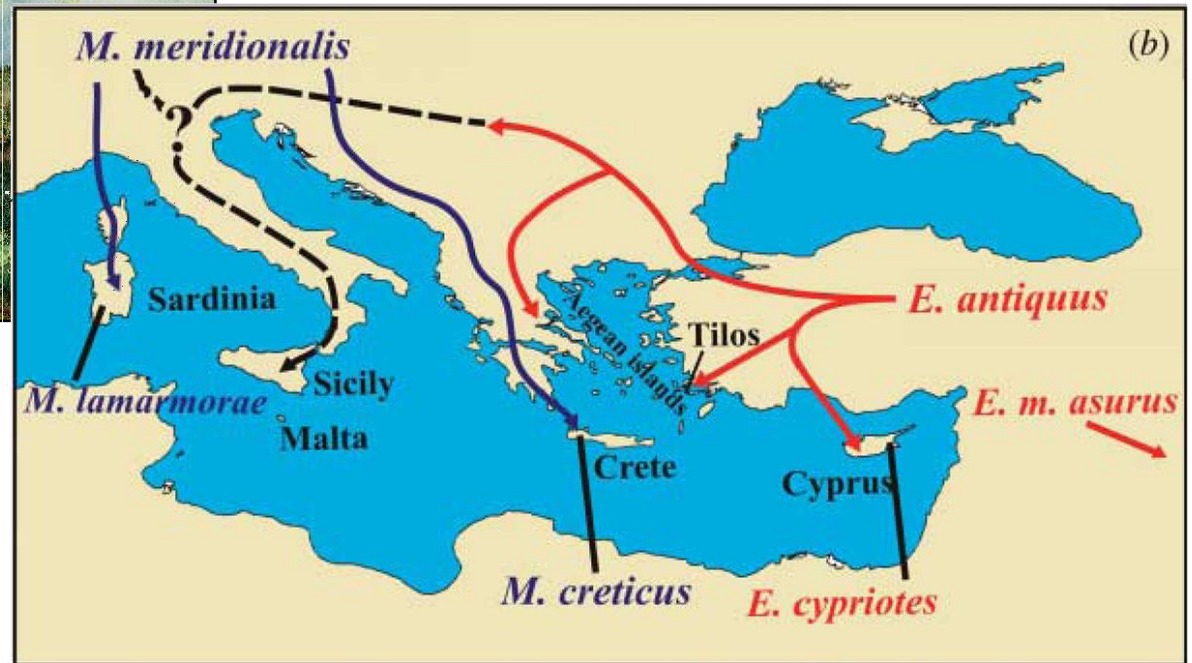
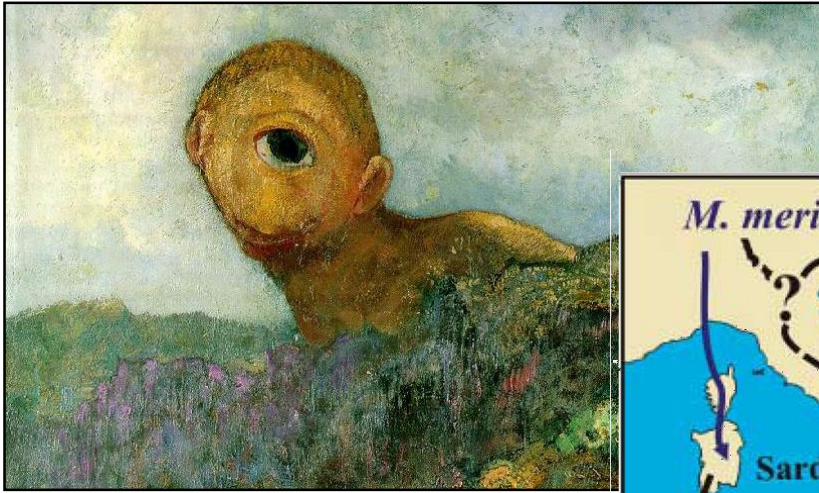




# Proboscidea (Paleoceno – Recente)

*Elephas* (Plioceno da África e Eurásia): inclui formas anãs do mediterrâneo

*Stegodon* (Indonésia) e *Mammuthus* (Sardenha, Creta, Ártico e Califórnia)



## Proboscidea (Paleoceno – Recente)

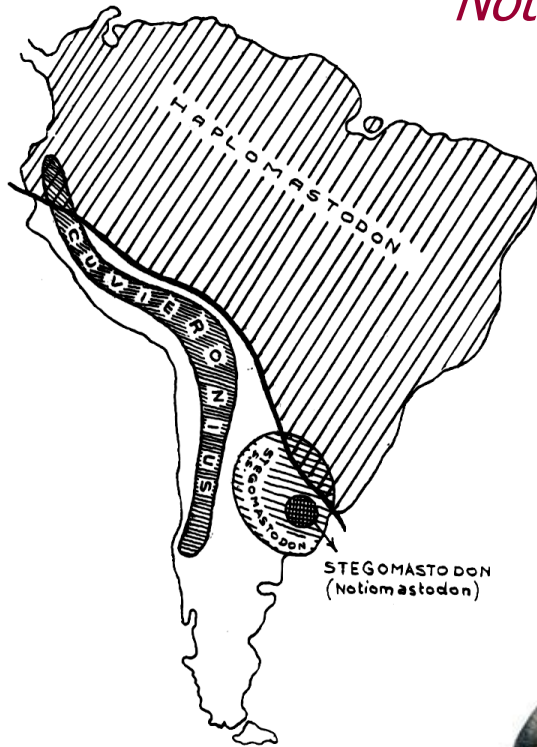


# Elephantoidea (Eoceno - Recente)

Cuvieroniiidae (Mioceno-Pleistoceno das Américas)

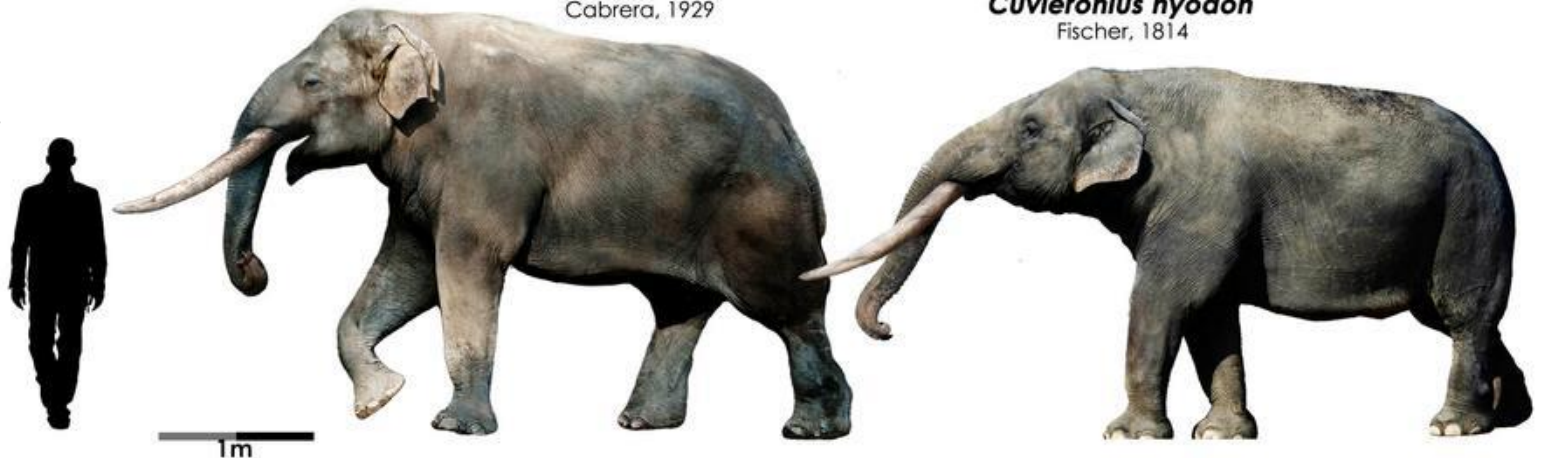
Gonfotérios que invadem América do Sul no Plio-Pleistoceno

*Notiomastodon* no Pleistoceno do Brasil



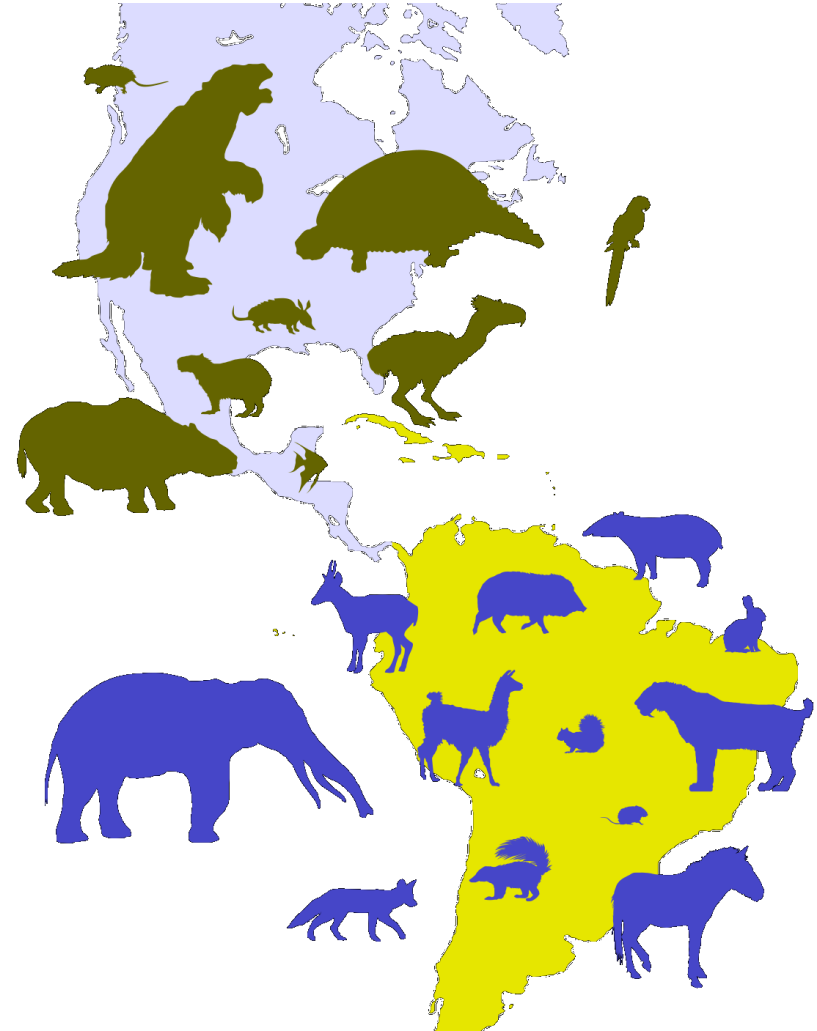
*Notiomastodon platensis*  
Cabrera, 1929

*Cuvieronius hyodon*  
Fischer, 1814



# Quaternário (Pleistoceno-Holoceno) últimos 2,5 Ma

No fim do Plioceno, forma-se o istmo do Panamá e as Américas conectam-se, gerando um importante intercâmbio faunístico



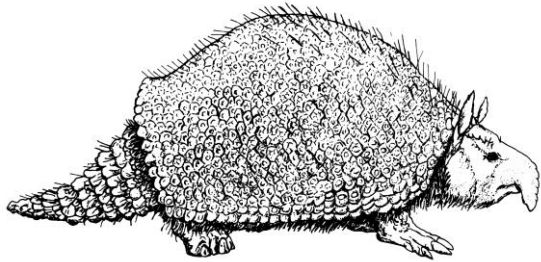
# Quaternário (Pleistoceno-Holoceno) últimos 2,5 Ma

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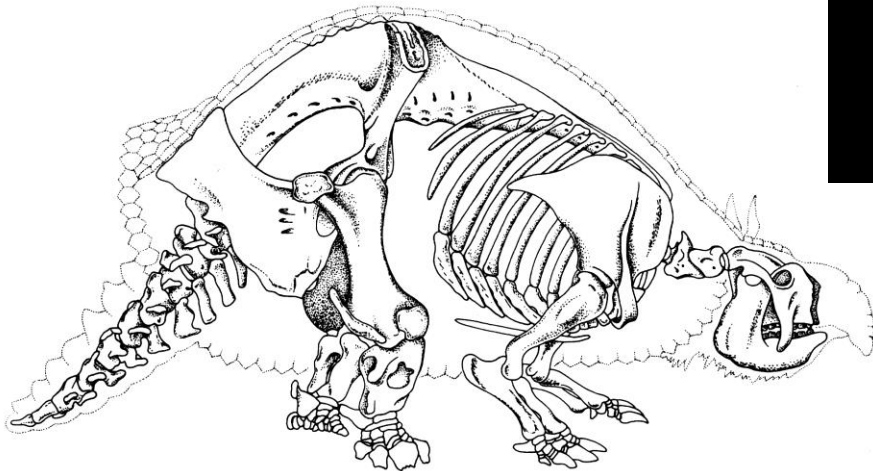


# Quaternário (Pleistoceno-Holoceno) últimos 2,5 Ma

No fim do Plioceno, forma-se o istmo do Panamá e as Américas conectam-se, gerando um importante intercâmbio faunístico



*Glyptotherium* (Plio-Pleistoceno da América do Norte)



Os preguiças-terrestres invadiram a América do Norte no Plioceno  
*Megalonyx* atinge o Alasca

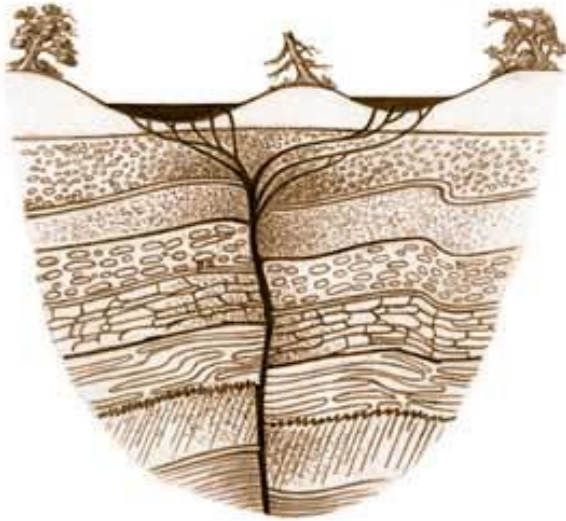
# Phorusrhacidae (Paleoceno-Pleistoceno)

*Titanis*: Pleistoceno da Flórida



# Rancho La Brea *tarpit* (Pleistoceno sup. da Califórnia)

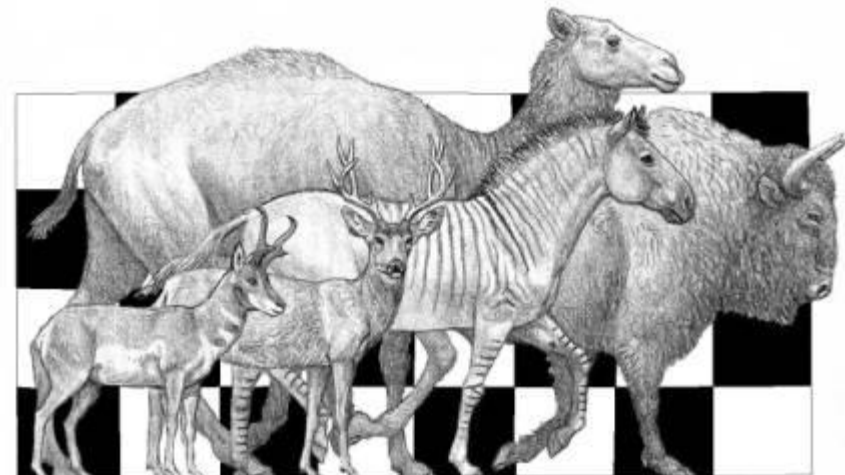
Soterramento rápido em posse de piche (ainda ativos) que formavam armadilhas naturais no verão (piche viscoso)





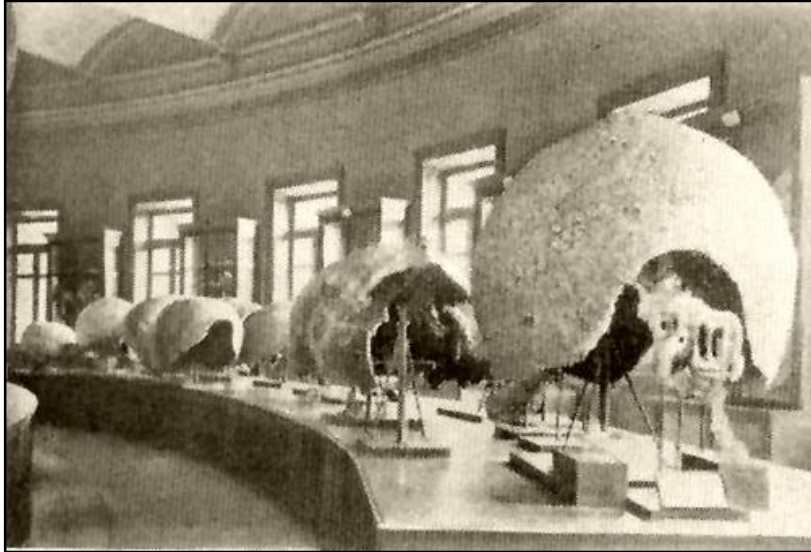
# Rancho La Brea *tarpit* (Pleistoceno sup. da Califórnia)

Soterramento rápido em posso de piche (ainda ativos) que formavam armadilhas naturais no verão (piche viscoso)



# **Xenarthra** (Paleoceno – Recente)

Gliptodontidae: formas herbívoras de até 2 toneladas

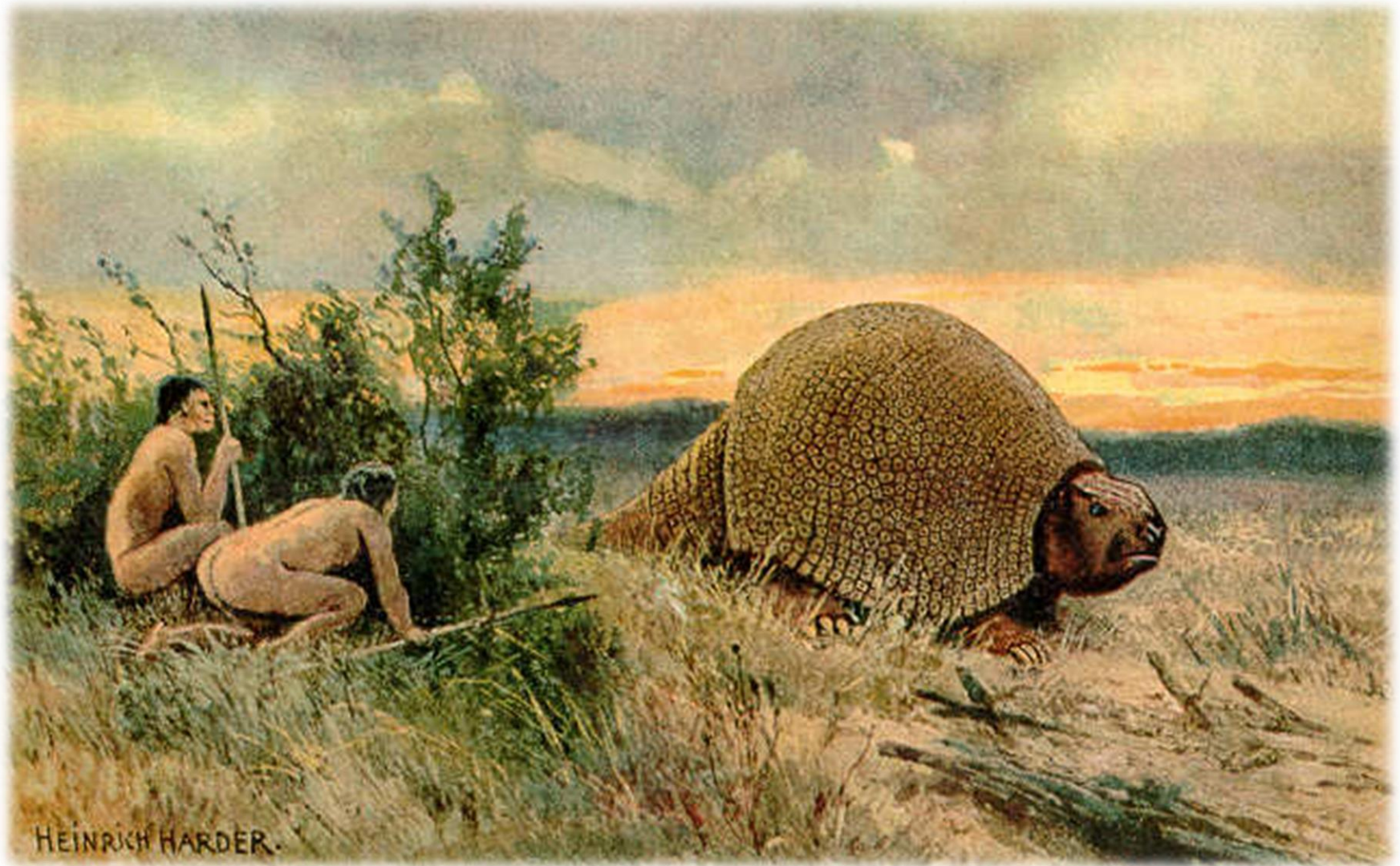


*Glyptodon*



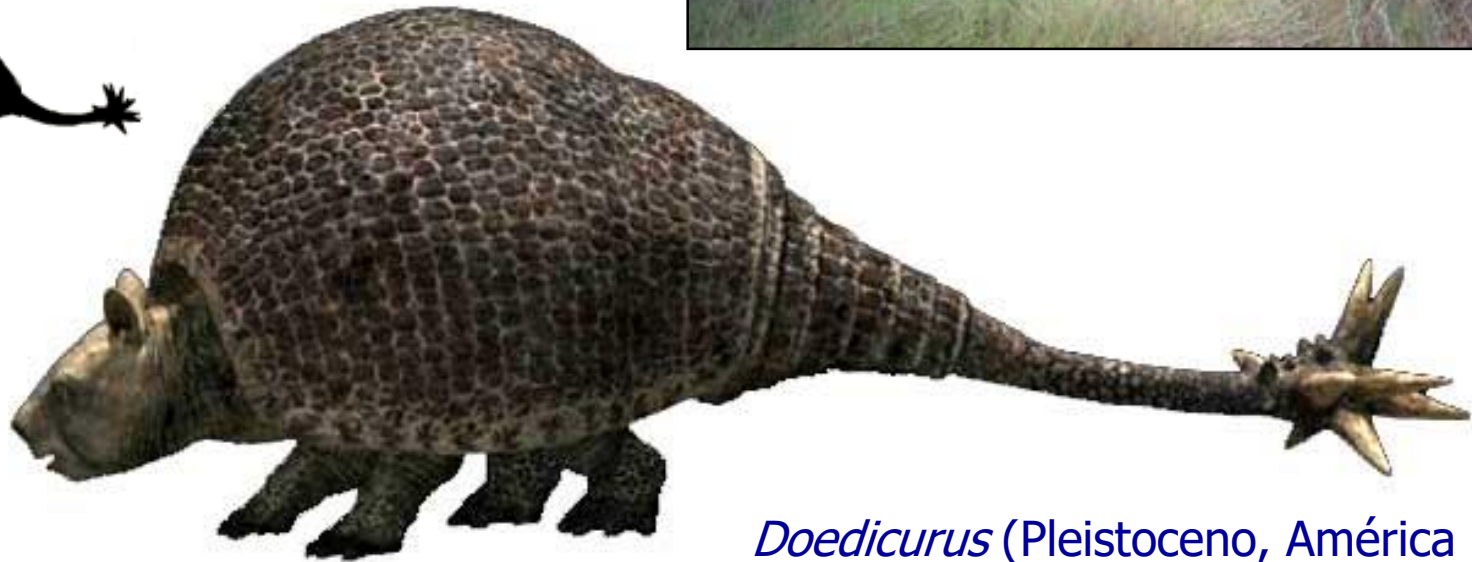
# **Xenarthra** (Paleoceno – Recente)

Gliptodontidae: formas herbívoras de até 2 toneladas



# Xenarthra (Paleoceno – Recente)

Gliptodontidae: algumas formas com cauda ornamentada



*Doedicurus* (Pleistoceno, América do Sul)

**Xenarthra** (Paleoceno – Recente)

Tardigrada (Oligoceno sup. – Recente)

Grupo mais basal (Mylodontidae): terrestres de médio porte



*Scelidotherium*, Pleistoceno da Argentina



*Mylodon*

Pleistoceno da Argentina e Rancho la Brea (Califórnia)



**Xenarthra** (Paleoceno – Recente)

Tardigrada (Oligoceno sup. – Recente)

Mylodontidae: vários registros no Pleistoceno do Brasil

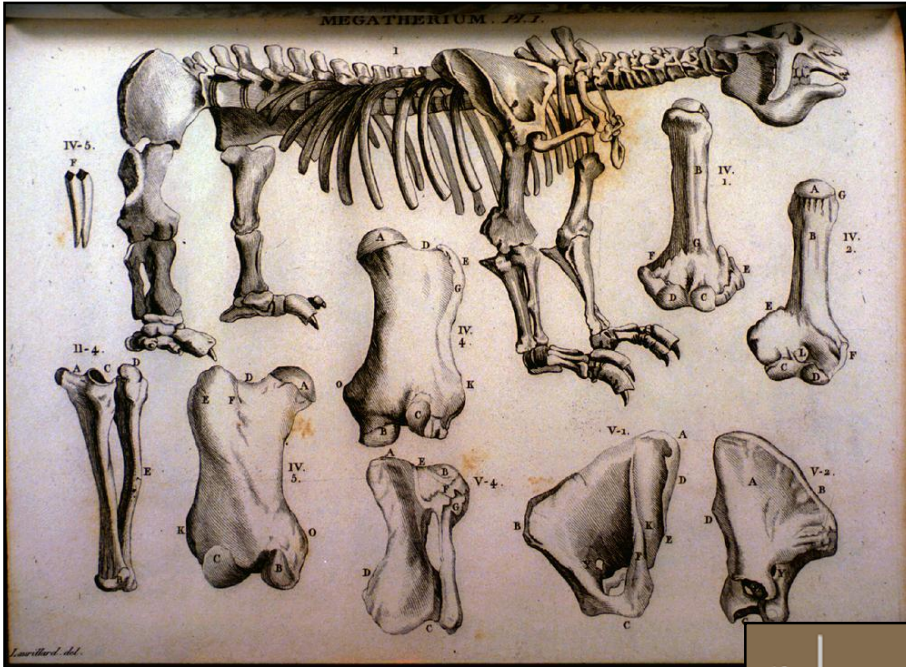
*Glossotherium* (Última Esperanza, Chile)

*Glossotherium*  
Rancho la Brea  
Califórnia



# Xenarthra (Paleoceno – Recente)

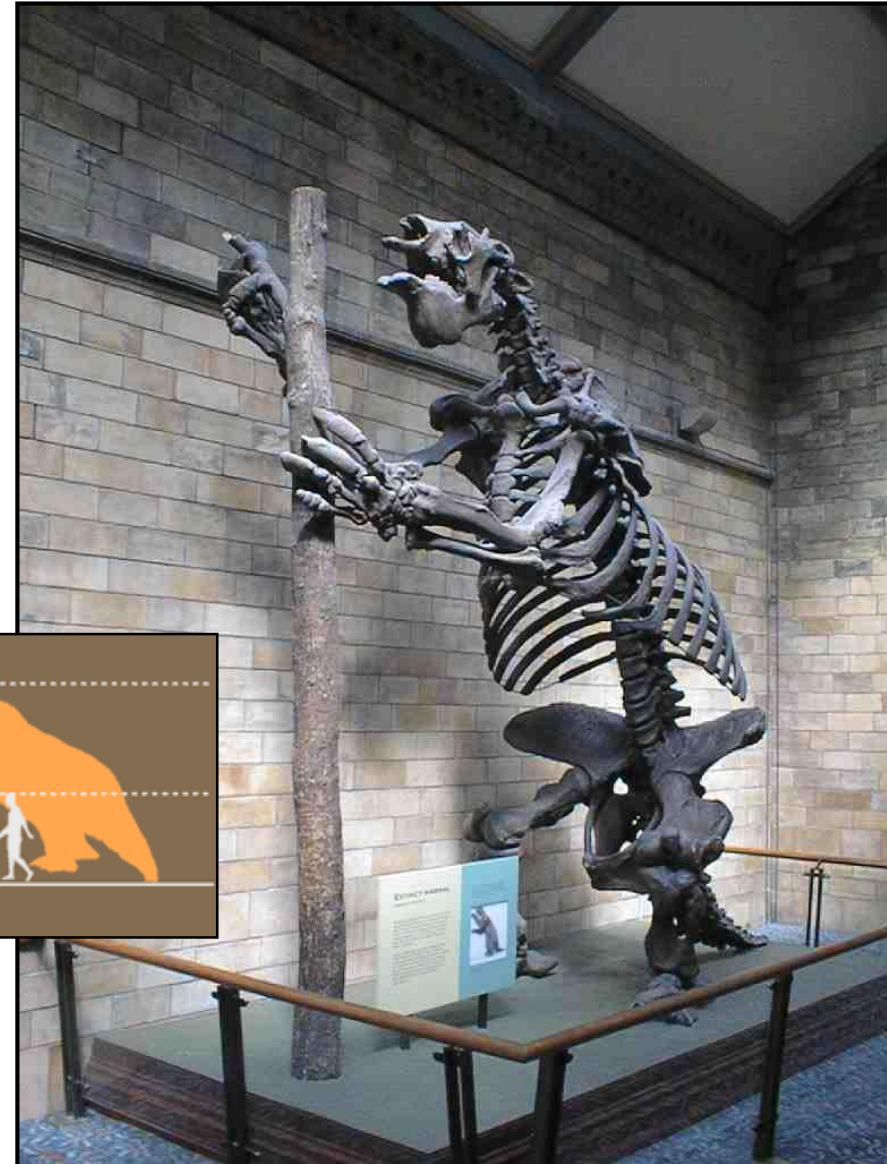
Tardigrada (Oligoceno sup. – Recente): Megatheriidae, gigantes terrestres



Cuvier (1812)



*Megatherium* atingia até 6 m,  
e era possivelmente onívoro  
Registros no RS



# **Xenarthra** (Paleoceno – Recente)

Megatheridae no Brasil: amplamente distribuído no Pleistoceno

Feto preservado (Toca da Boa vista, BA) de *Nothrotherium maquinensis*



*Eremotherium*

Registros em quase todos  
estados brasileiros

Até 5 toneladas

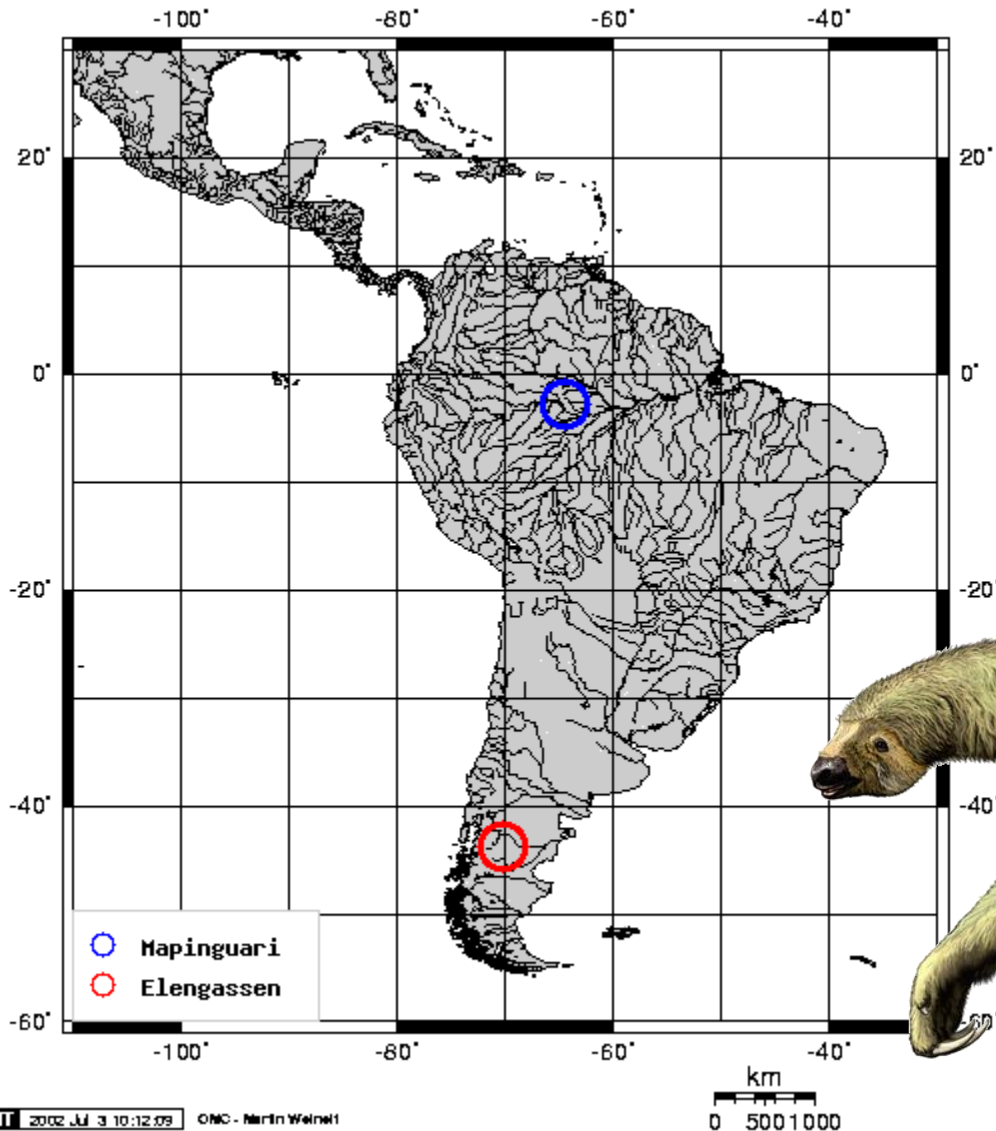
Posso Encantado  
(Chapada Diamantina)



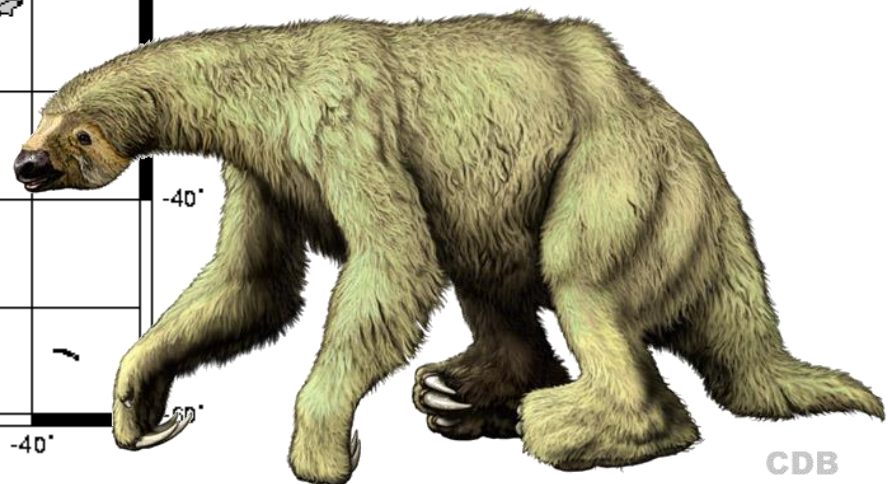


# Xenarthra (Paleoceno – Recente)

Preguiças-terrestres se extinguem no Pleistoceno (Matinguari!)



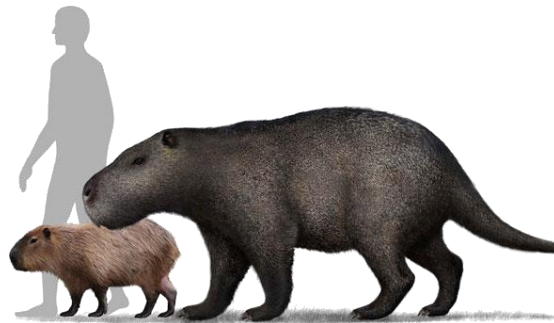
David Oren



# Rodentia (Cretáceo?, Paleoceno – Recente)

Caviomorpha: *Josephoartigasia* (Plioceno do Uruguai)

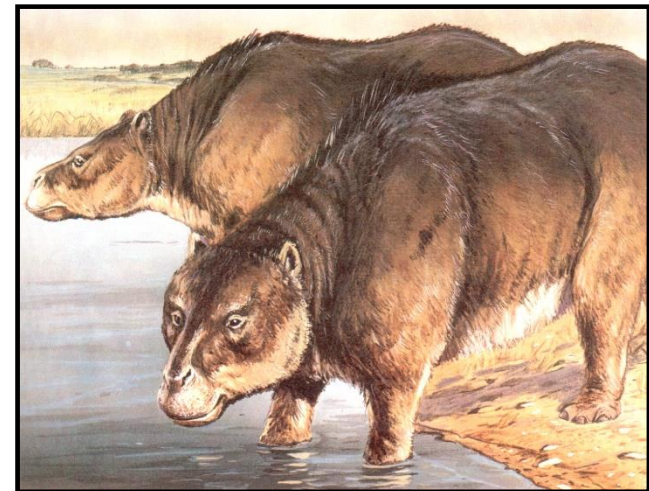
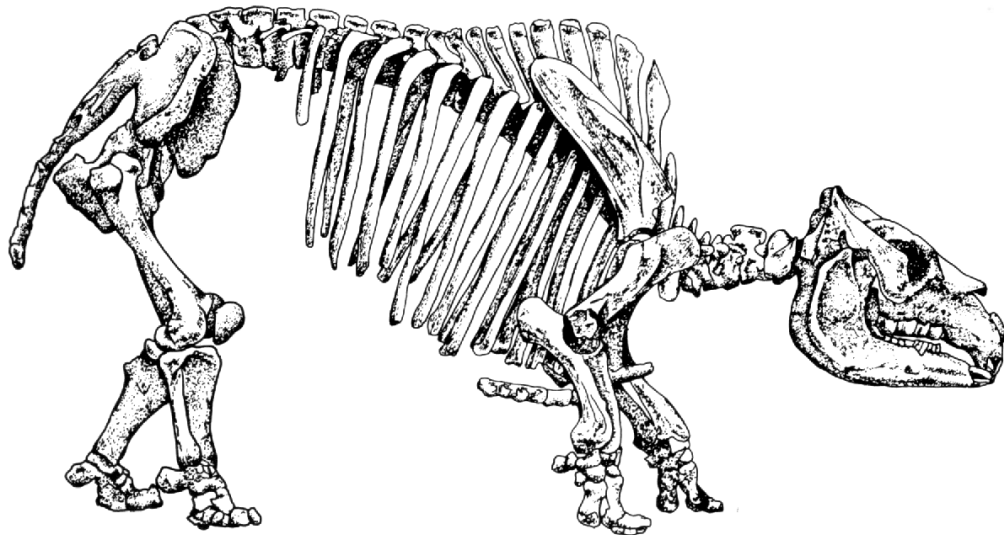
Também afim à Pacarana: maior roedor já existente (até 1.500 kg)



# Meridiungulata (Paleoceno - Recente)

Notoungulata (Paleoceno – Pleistoceno)

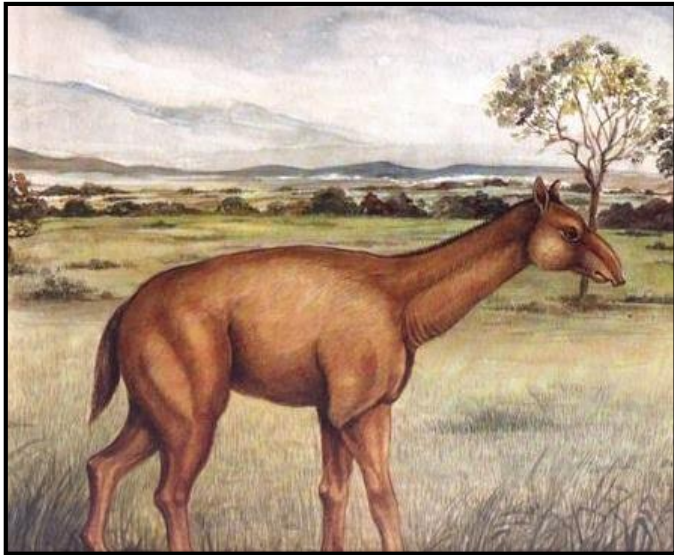
*Toxodon* do Pleitoceno (inclusive no Brasil) atinga o tamanho de um urso



# **Meridiungulata** (Paleoceno - Recente)

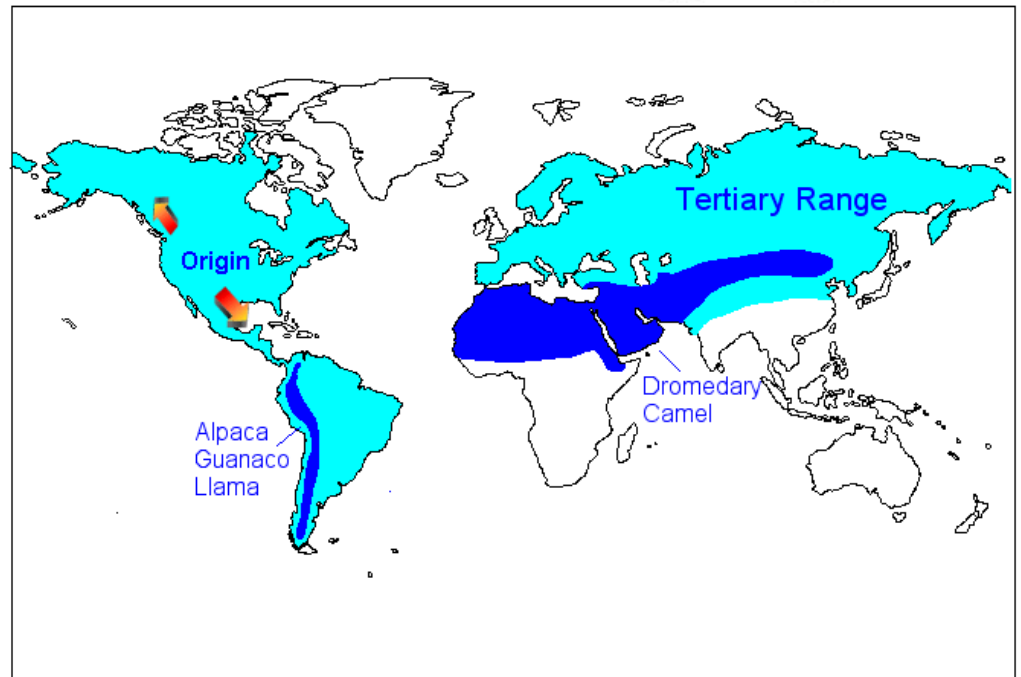
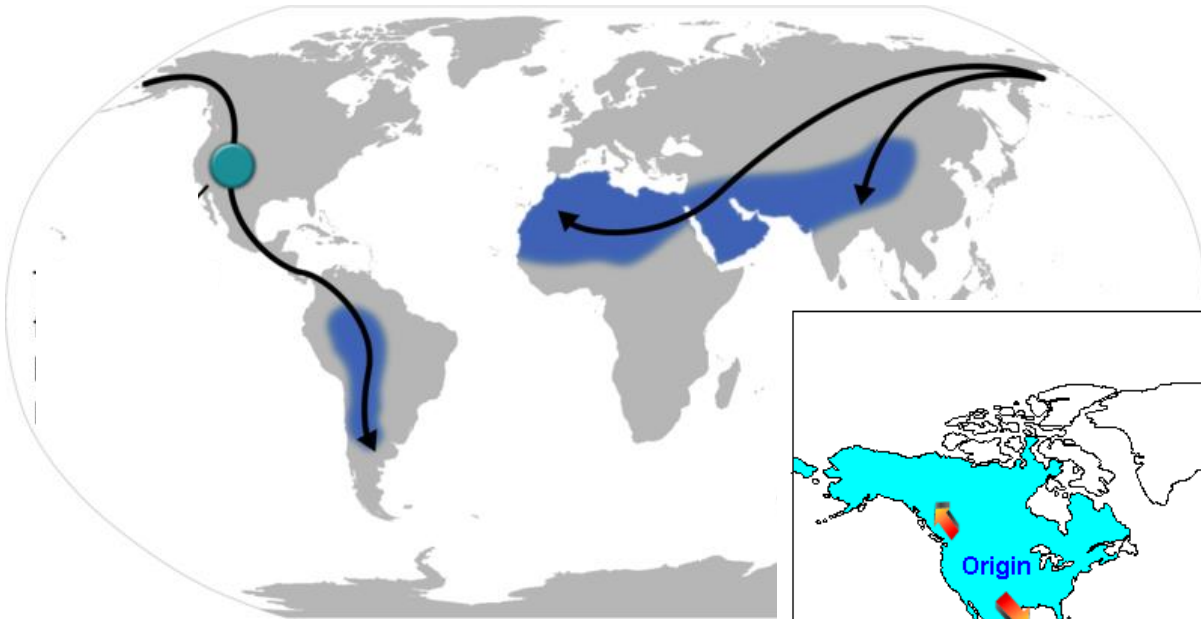
Litopterna (Paleoceno – Pleistoceno)

No Brasil: Paleoceno de Itaboraí, Mioceno de Taubaté,  
e no Pleistoceno de Minas e Bahia (*Xenorhinotherium*)



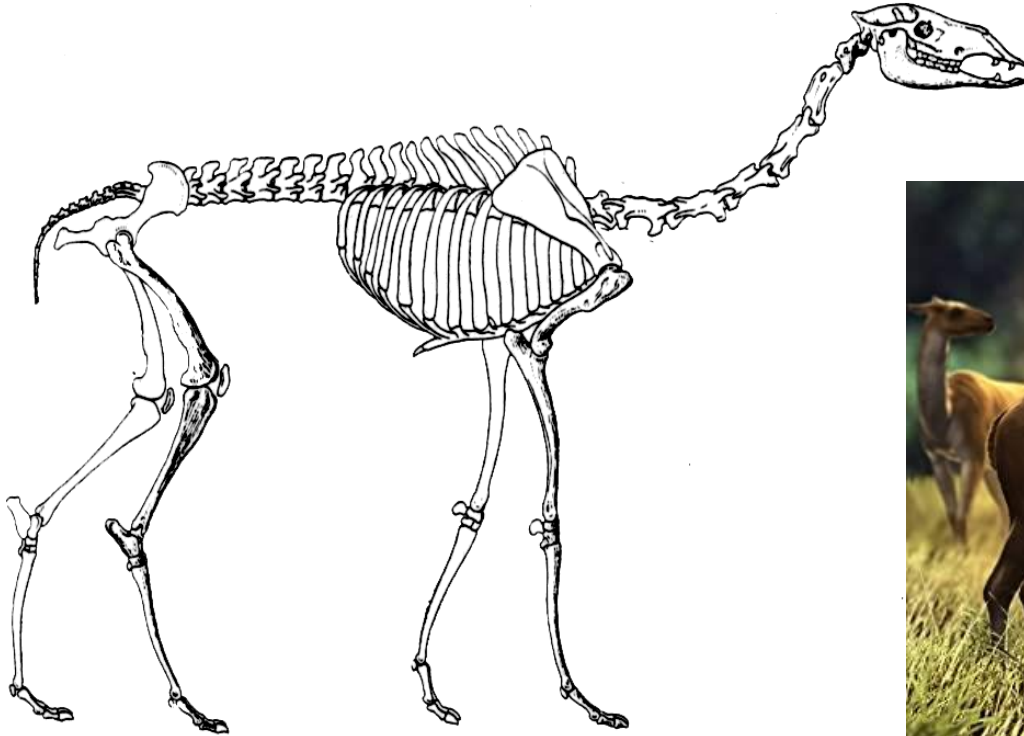
# Artiodactyla (Eoceno – Recente)

Camelidae (Eoceno – Recente) - Dispersam para Ásia e África no Mioceno e América do Sul no Plioceno, extinguem-se na América do Norte



## **Artiodactyla** (Eoceno – Recente)

Camelidae (Eoceno – Recente) - Dispersam para Ásia e África no Mioceno e América do Sul no Plioceno, extinguem-se na América do Norte



No Brasil: *Palaeolama* no Pleistoceno do Nordeste e Minas Gerais  
Evidências de clima mais úmido

## **Perissodactyla** (Eoceno – Recente)

Equidae (Eoceno – Recente): dispersão para a América do Sul no Plioceno e extinção nas Américas no Pleistoceno

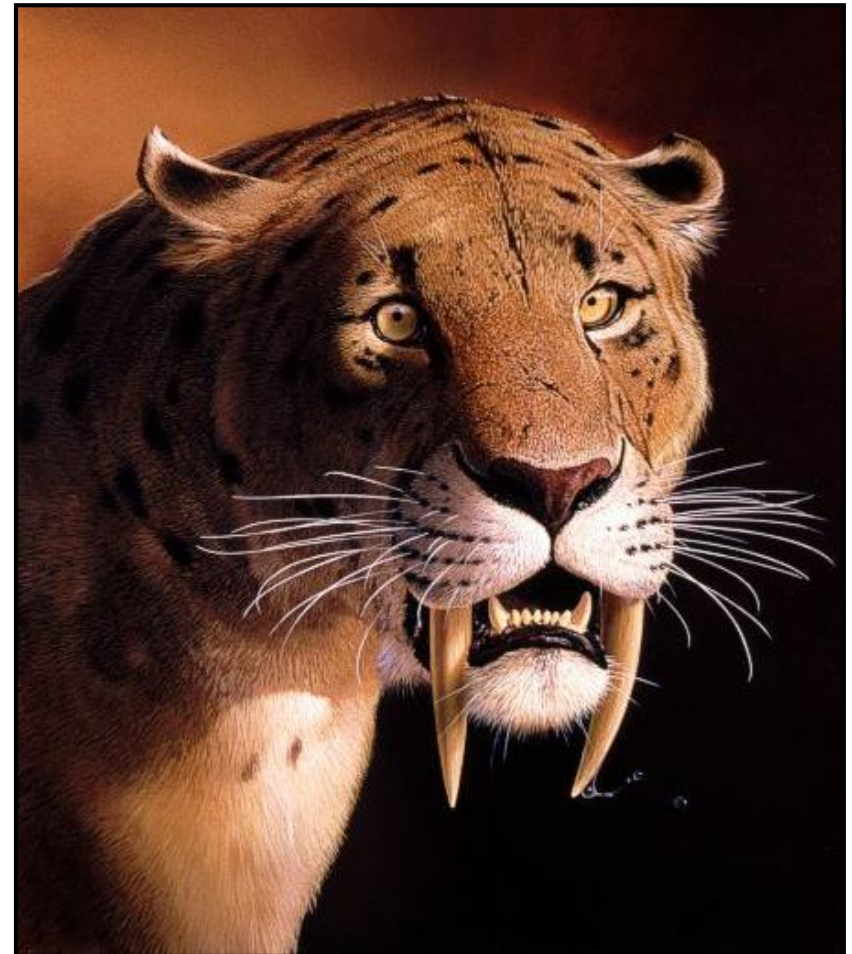
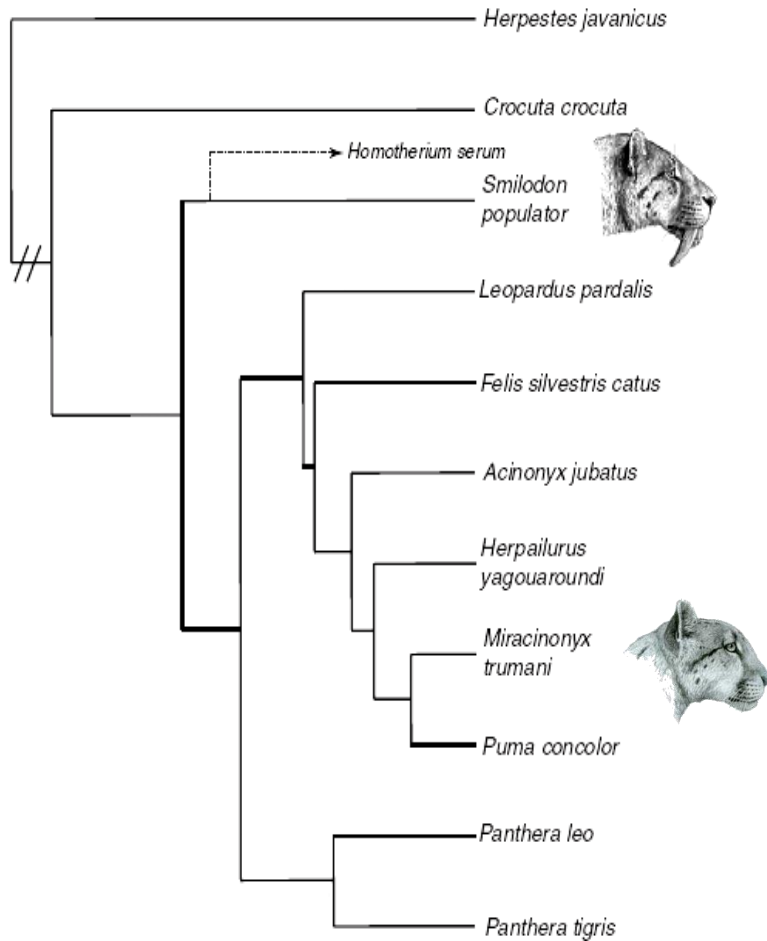


No Pleistoceno do Brasil:  
*Equus* e "*Hippidion*" (forma mais rara, primitiva e robusta)

# Carnivora (Paleoceno – Recente)

Felidae (Oligoceno - Recente): “Tigres-dente-de-sabre”

Machairodontidae: grupo irmão dos felinos vivos





## **Carnivora** (Paleoceno – Recente)

Felidae (Oligoceno - Recente): “Tigres-dente-de-sabre”

Machairodontidae: grupo irmão dos felinos vivos



*Smilodon* (Plio-Pleistoceno das Américas)