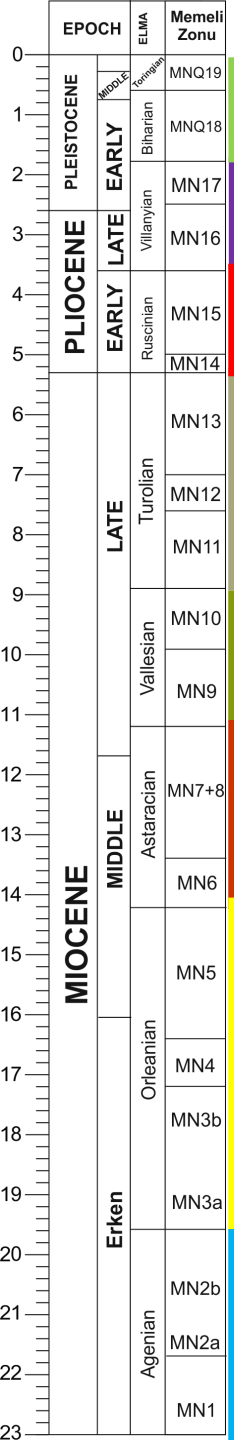
Mammalian Bio-Stratigraphy of Upper Cenozoic of TURKEY

Serdar MAYDA

Curator,Dr.

Ege University, Natural History Museum

35100 Bornova-İzmir / TURKEY



10 Pleistocene

43 Villanian – Late Pliocene – Early Pleistocene

27 Ruscinian – Early Pliocene

105 Turolian - Late Miocene

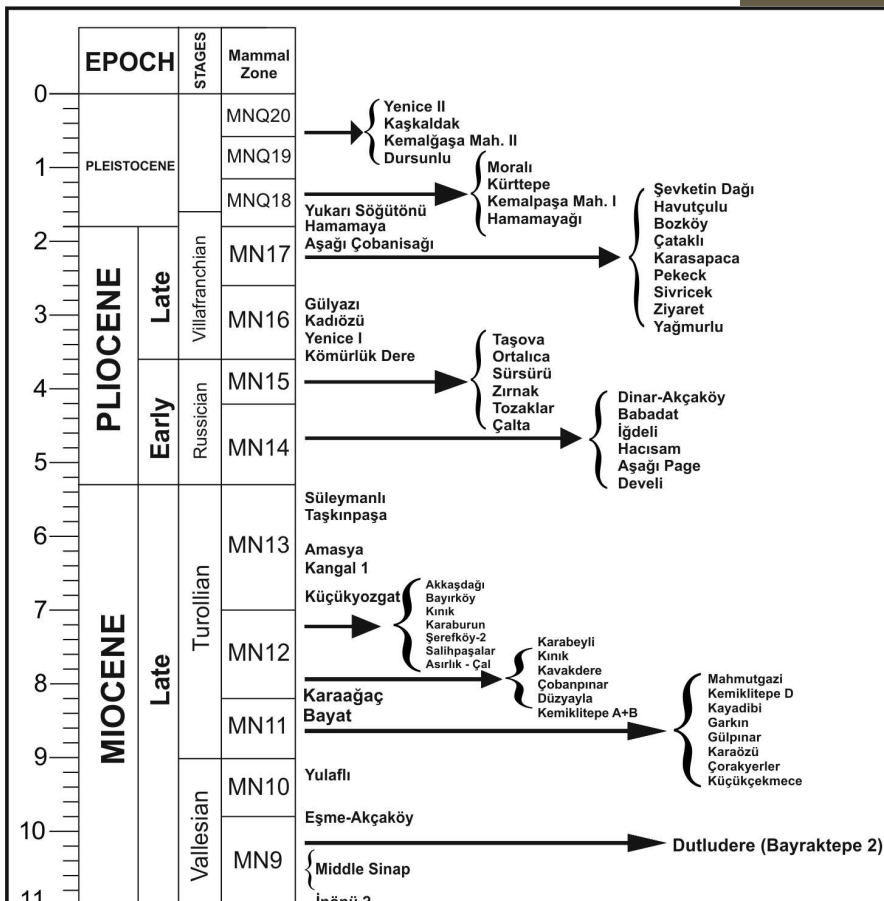
62 Late Miocene

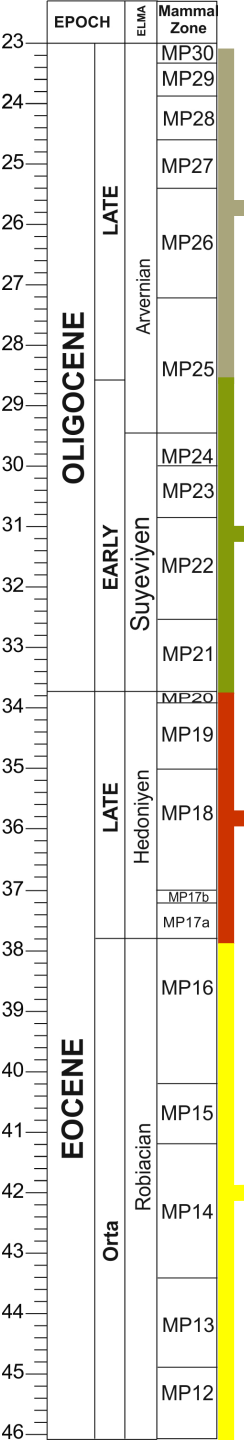
67 Vallesian - Late Miocene

40 Astaracian – Middle Miocene

65 Orlenian – Early - Middle Miocene

13 Agenian – Early Miocene



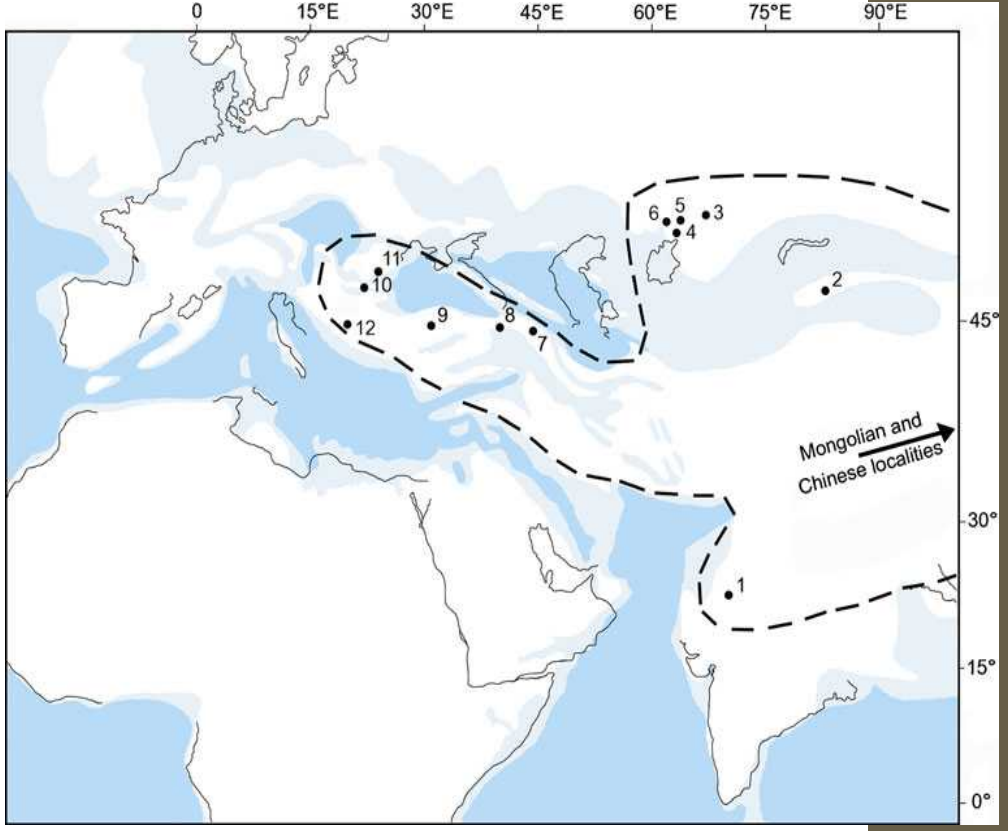


11 Arvernian – Late Oligocene

11 Suyevian – Early Oligocene

1 Late Eocene

7 Erken-Orta Eocene + 1 (?) Paleocene



İller	Toplam Bulgu Yeri	Paleosen	Eosen	Oligosen	Miyosen Erken/Orta/Geç			Pliyosen Erken/Geç		Pleyistosen	Holosen
01 ADANA	2						2				
03 AFYON	15					5	4	1	3	2	
05 AMASYA	9		3					1		5	
06 ANKARA	39		2		11	10	14	1	1		
09 AYDIN	13				3		3		1	6	
11 BİLECİK	1	?1									
14 BOLU	4						1	1	2		
15 BURDUR	5						1	3		1	
16 BURSA	3					1					
17 ÇANAKKALE	23					6	17				
18 ÇANKIRI	11						8		2	1	
19 ÇORUM	12			4	2	3	3				
20 DENİZLİ	10					4	3	3			
22 EDİRNE	20			8		1	10			1	
23 ELAZIĞ	2							2			
24 ERZURUM	3							2	1		
26 ESKİŞEHİR	9						2	3	3	1	
32 ISPARTA	2					1	1				
33 İÇEL	2				1	1					
34 İSTANBUL	2					1	1				
35 İZMİR	18				8	4	5		1		
37 KASTAMONU	3							1	1	1	
38 KAYSERİ	22				2		16	4			
39 KIRKLARELİ	3			2			1				
40 KIRŞEHİR	10		1		3		1			1	
42 KONYA	20				1	3	11	1		4	
43 KÜTAHYA	16		1		2	6	5	2			
45 MANİSA	38				8	4	1	5	17	3	
46 K.MARAŞ	1							1			
49 MUĞLA	21				1	7	12			1	
49 MUŞ	4							1	2	1	
50 NEVŞEHİR	10						8	1			1
54 SAKARYA	2									2	
55 SAMSUN	5							1	2	2	
57 SİNOP	6		1	1	1		1			2	
58 SİVAS	22			2	2	1	16	1			
59 TEKİRDAĞ	12			3	1	3	5				
60 TOKAT	1		1								
61 TRABZON	1						1				
64 UŞAK	10				1		9				
66 YOZGAT	3						3				
68 AKSARAY	5						5				
71 KIRIKKALE	3			2			1				
75 ARDAHAN	1		1								
	424		10	22	47	63	176	34	36	34	1

1 Paleocene

10 Eocene

27 Oligocene

48 Early Miocene

65 Middle Miocene

180 Late Miocene

34 Early Pliocene

36 Late Pliocene

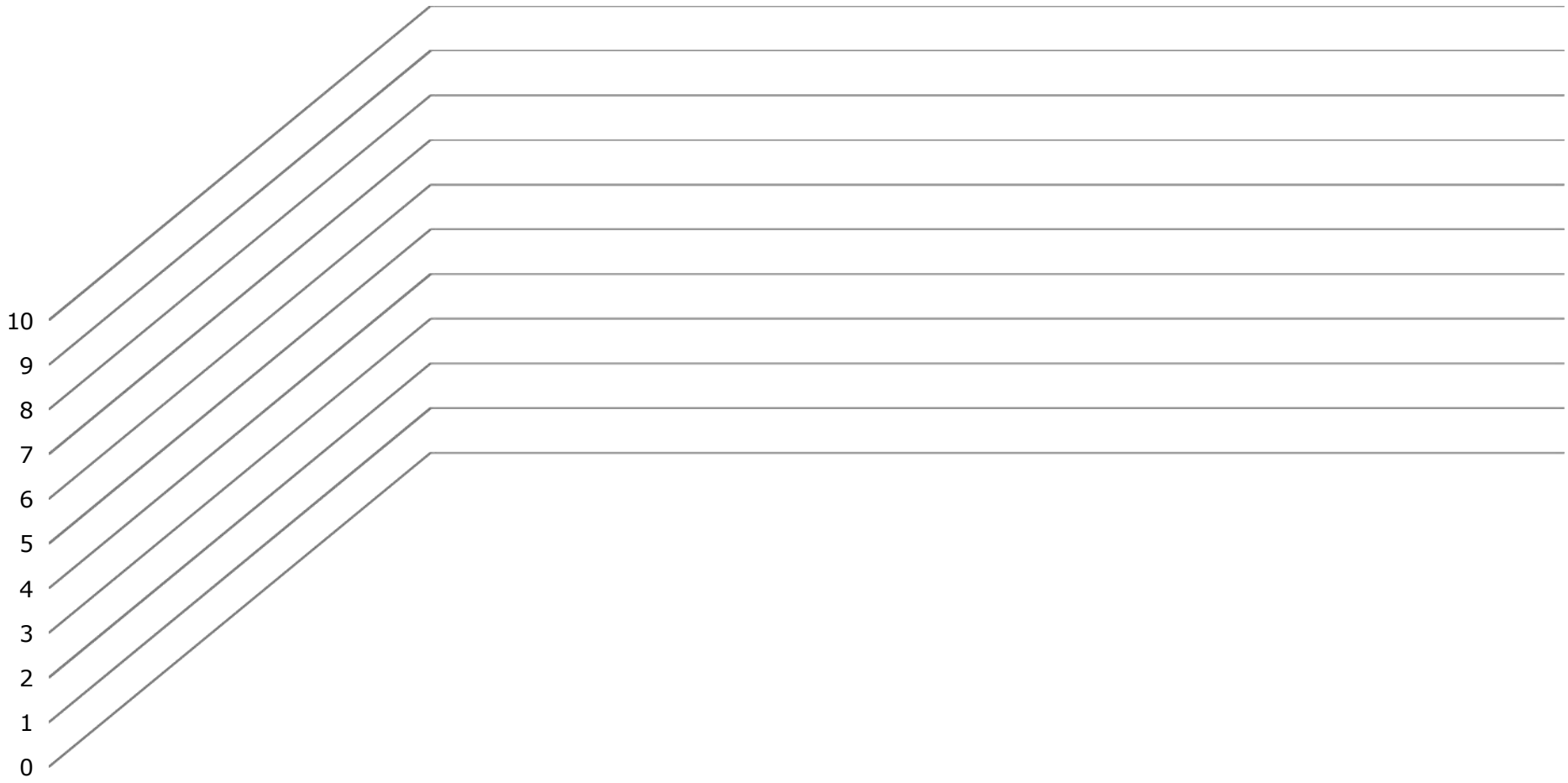
34 Pleistocene

1 Holocene

* (Ozansoy, 1965, 1966; Sickenberg ve diğ., 1975; Ünay ve Bruijn, 1987; Bruijn ve diğ., 2003; Saraç, 2003; Kaya ve diğ., 2001, 2003, 2005; Geraads ve diğ., 2005; Şen, 2005).

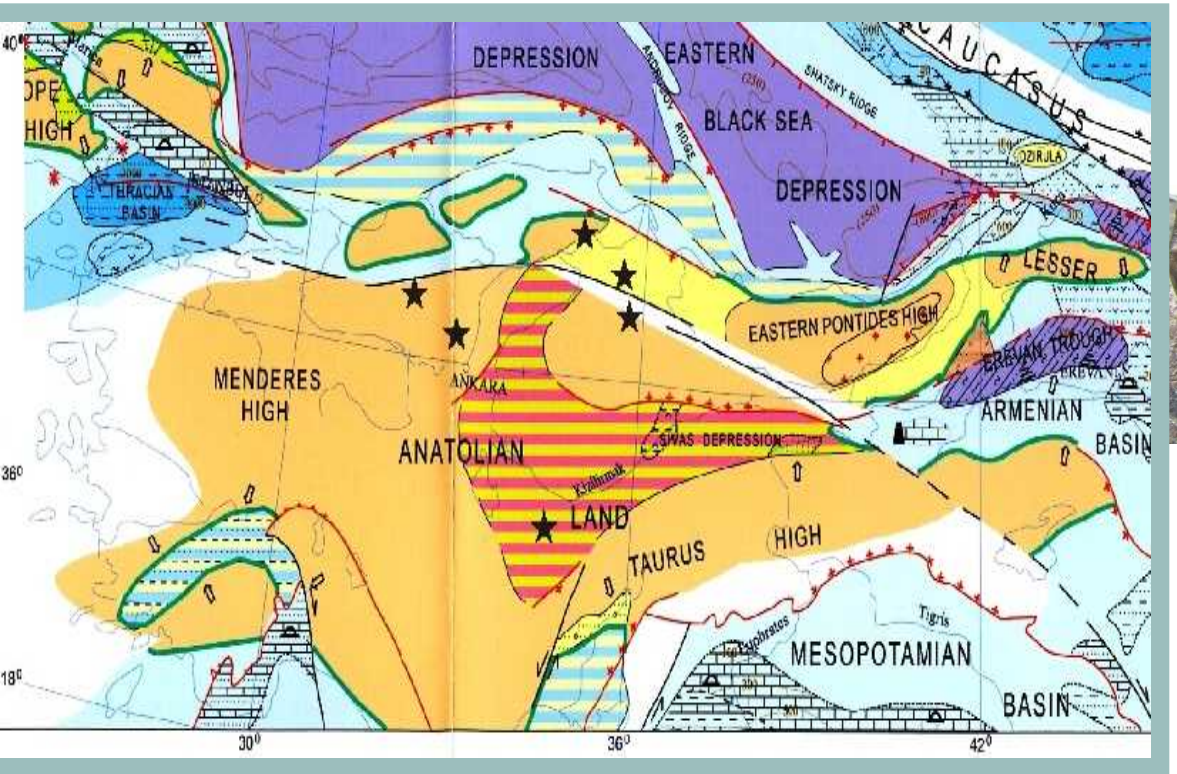
Jeolojik Miras Açısından Türkiye Paleomemeli Faunası

T. KAYA; G.SARAç



EOCENE (46-34 My)

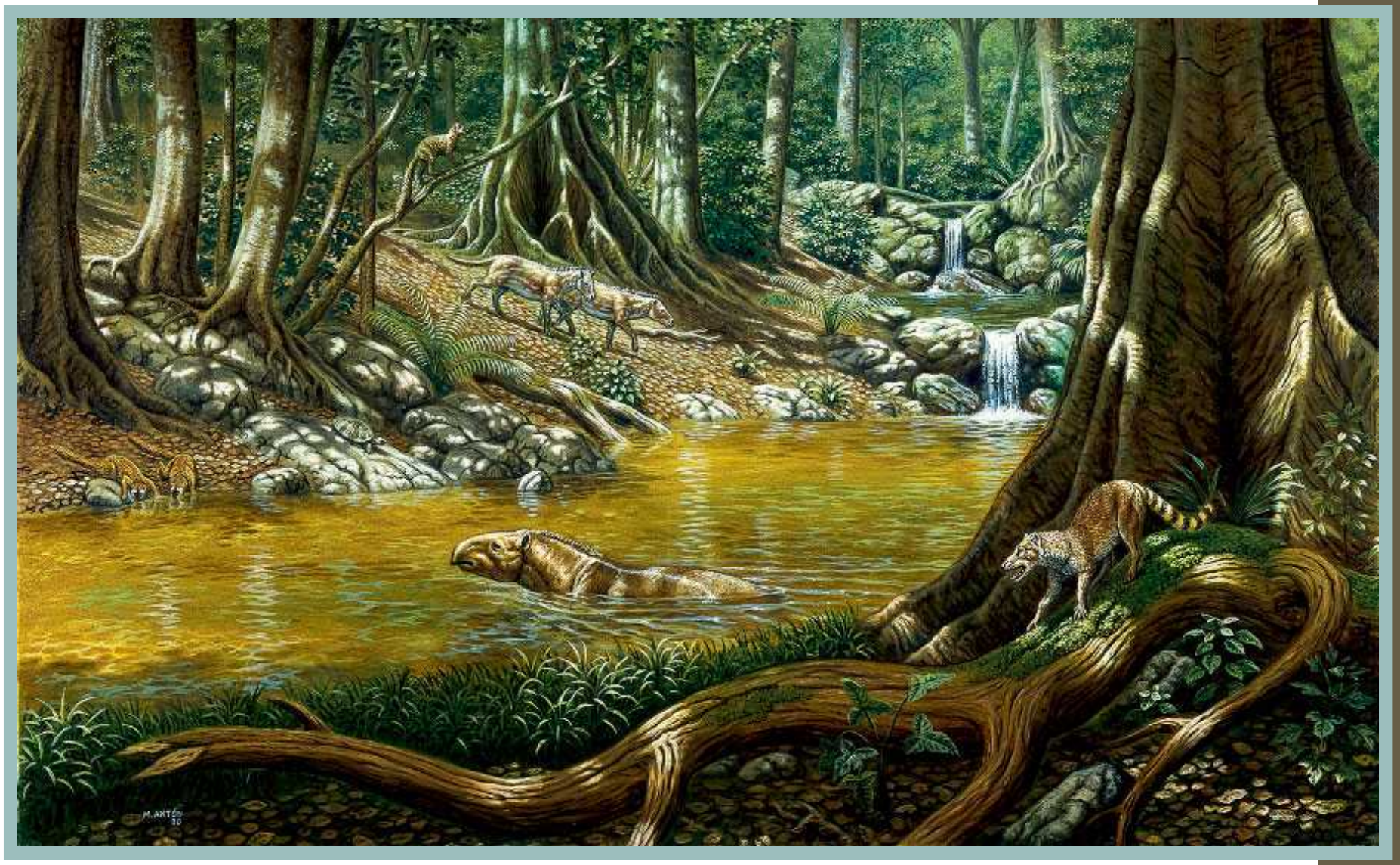
- Amasya-Eski Çeltek,
- Kırşehir-Çiçekdağı,
- Sinop-Boyabat,
- Tokat-Bultu-Zile
- Yozgat-Boğazlıyan.



1. *Paleoamasia* (Embrithopoda) (Ozansoy, 1966; Şen ve Heintz, 1979; Kaya, 1995).
2. *Parabunodon* (Artiodactyla) (Ducrocq ve Şen, 1991).

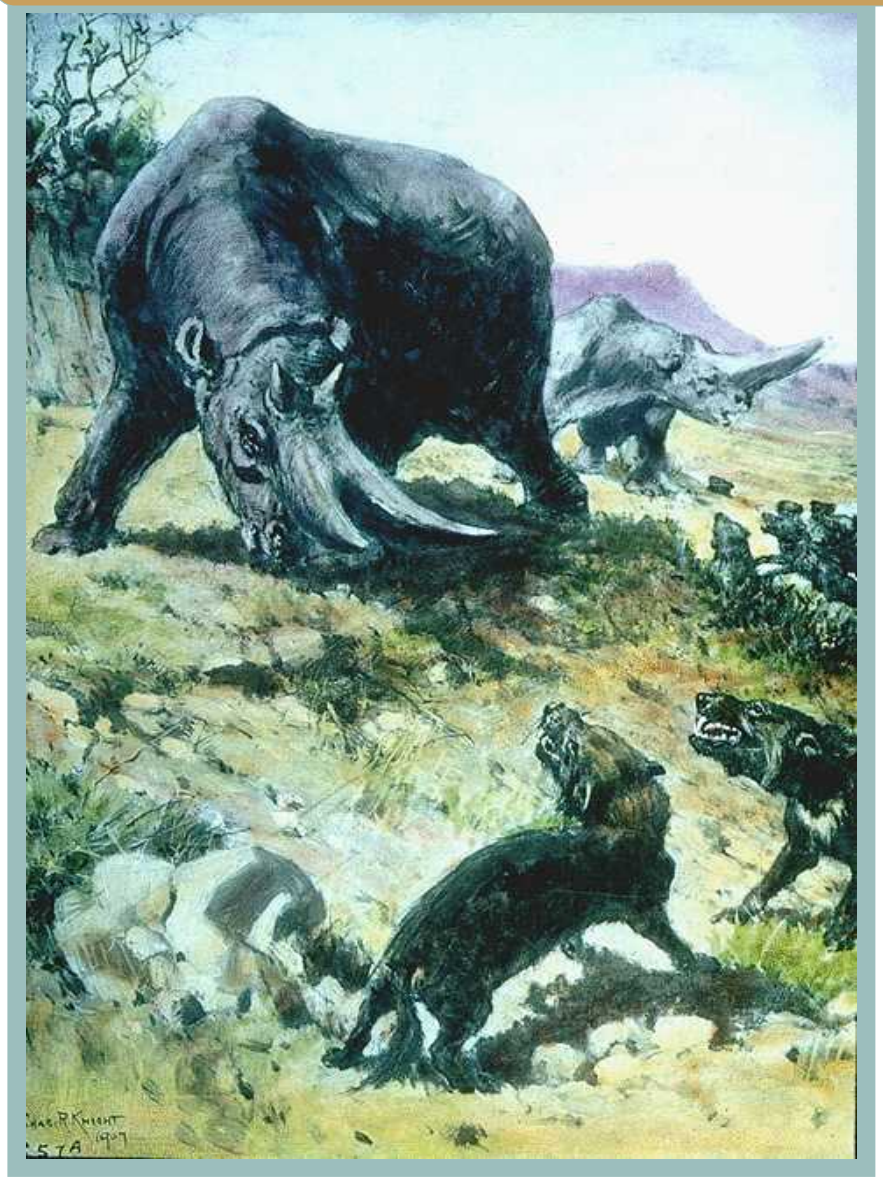
Son yıllardaki çalışmalarda, Ankara-Orhaniye yöresindeki Uzunçarşıdere formasyonu *Paleoamasia*, *Hypsamasia* (Embrithopoda) ve *Hilalia* (Condylarthra) fosillerine göre Erken Orta Eosen olarak yaşlandırılmıştır (Mass ve diğ, 1998).

Eosen paleomemeli faunası Türkiye'nin; Afrika, Asya ve Avrupa arasında yaşanan zoocoğrafik ilişkiler için büyük bir paleobiyocoğrafik alan oluşturduğunu savını destekler.



La Boixedat (İspanya) Early Eosen
***Agerinia* (Primates); *Lophiodon* (Perissodactyla); *Phenacodus* (Condylar**
***Proviverra* (Creodont).**

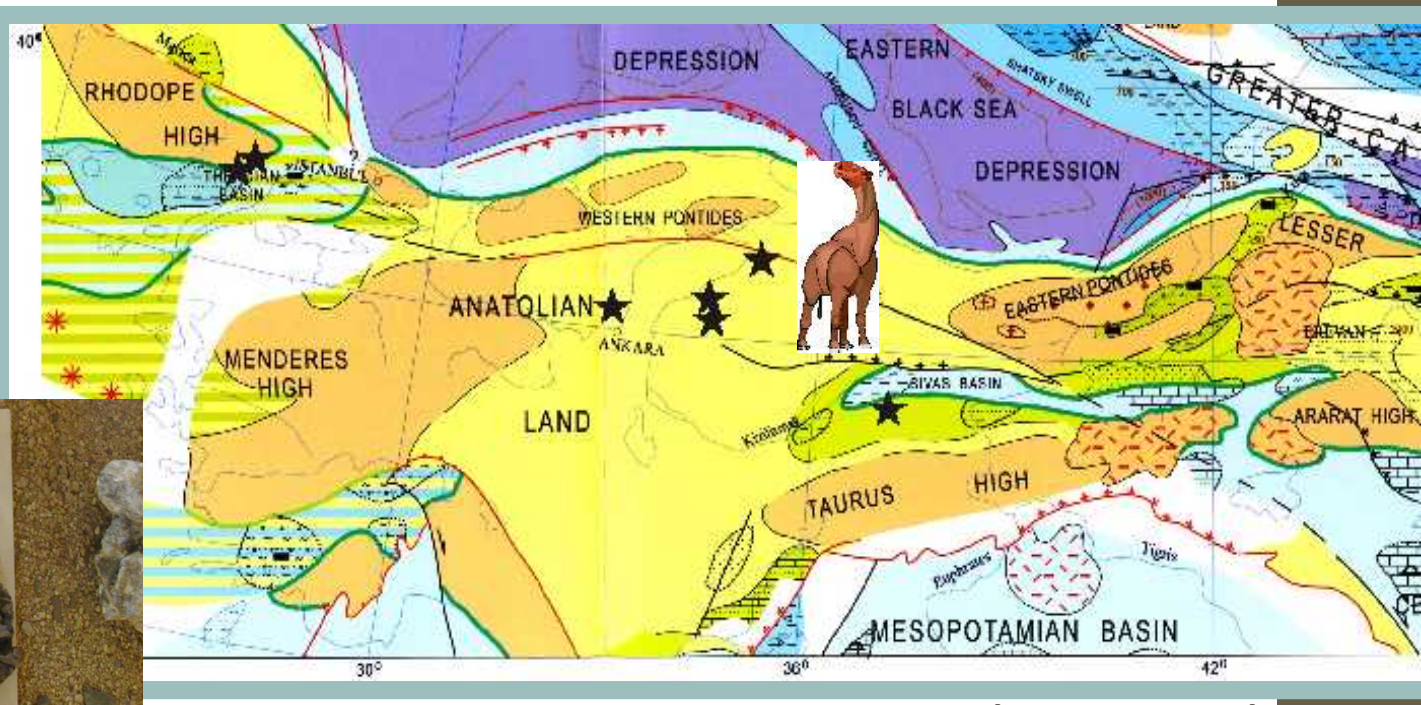
Arsinoitherium (Embrithopoda)



Pterodon (Creodont)

OLIGOSEN (34-23 My)

1. Edirne-Keşan-Kocayarmalar
2. Edirne-Keşan-Kavakdere
3. Edirne-Keşan-Paşaköy
4. Edirne-Keşan-Karacaali
5. Edirne-Keşan-Yeniköy
6. Tekirdağ-Malkara-Hasköy

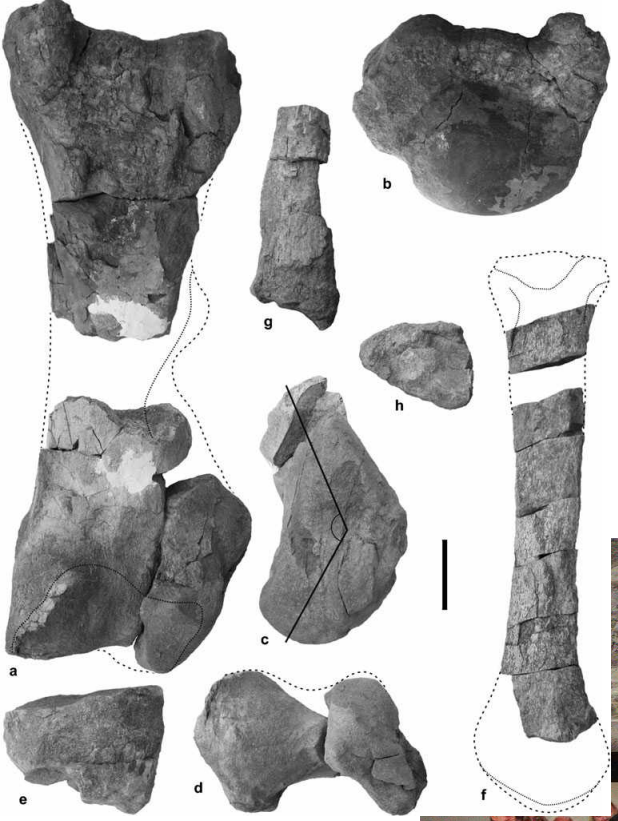


***Elomeryx* & *Antracotherium* (Artiodactyla) (Ozansoy, 1966; Ünay, 1989)**

According to the most recent studies, the present day tectonic frame of Anatolia began to form in the Early Miocene (e.g. Şengör et al., 1985; Yılmaz, 1992). The palaeogeography of Turkey was dominated by an erosional highland area with continental deposition surrounded by shallow seas in the north, east and south at that time. This highland was dissected in the Aegean region by fault–bounded basins which have been generally N–S trending. In western Anatolia, many basins were filled during the Late Oligocene and Miocene period (Akgün et al., 2007; Kaya & Mayda, 2011).

Central Anatolia is made up of several continent fragments that were assembled during the Late Cretaceous–Early Tertiary time interval as a result of the closure of multibranched Neotethyan ocean (Şengör and Yılmaz, 1981). Sedimentary basins were also developed during the Cretaceous–Tertiary period in a variety of localities in central Anatolia (Akgün et al., 2007).

Oligocene
Elomeryx (Anthracotherid

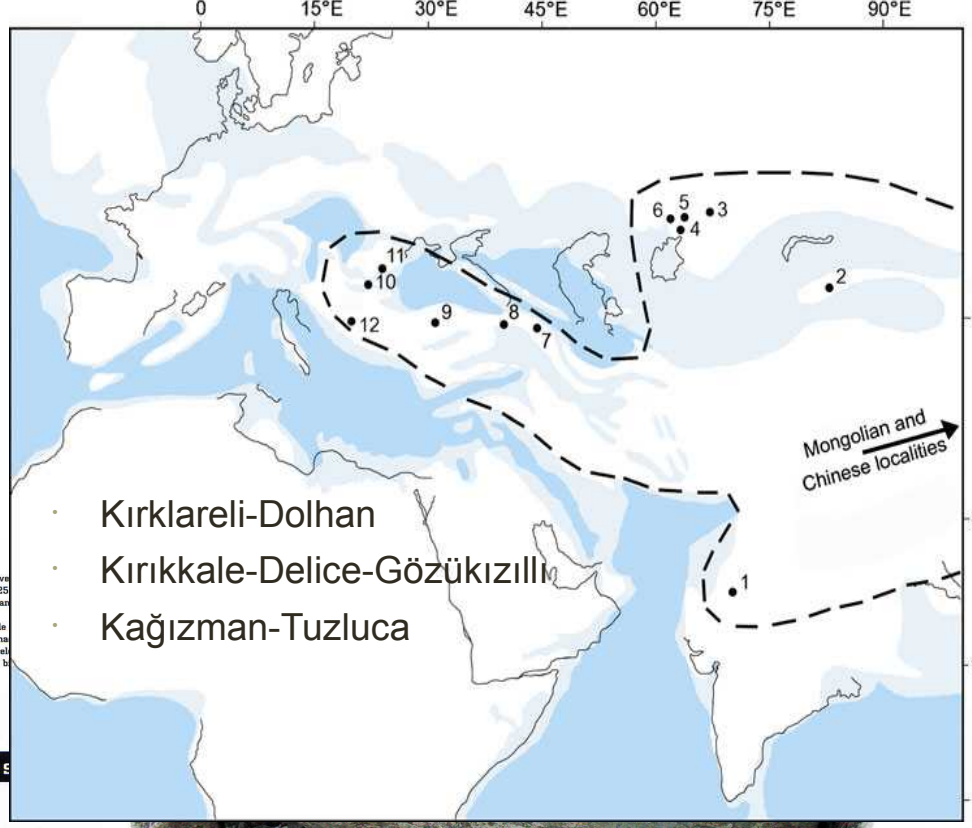


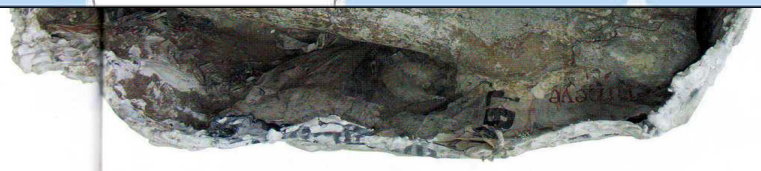
Bugün kurak ve
günümüzden 25
iklime ve orman

Tortullar içinde
bulan araştırma
kemiğinin, incel
Baluchitherium b
(altta).

11 milyon yıl hüküm s

Bir koyunun alt-çenesiyle Baluchitherium alt-çenesi yanyana. Hayvanın büyüklüğünü anlamak için fazla söze gerek kalmıyor (sağda).





Baluchitherium'un ilk keşfedildiği yer olan Belucistan'da, 1912'den son zamanlara kadar herhangi bir çalışma ne yazık ki yapılamadı. Pakistan'ın bu bölgesinde yıllardır devam eden iç savaşlar yabancı araştırmacıların bu bölgede çalışmasını engelledi. Fakat 1995-2004 arasında özel izin alarak bu bölgede çalışma şansı elde eden Fransız paleontologlardan oluşan bir ekip, Baluchitherium ve onunla ilgili fauna hakkında çok önemli bilgiler elde etti. Yaptıkları kazı çalışmalarında ortaya çıkan çok sayıda kemik sayesinde, ilk kez tam bir iskelet elde etme şansı doğdu. Sonuçta, buldukları kemikleri iskelet üzerindeki konumlarına uygun şekilde [illegible] şeklini ortaya çıkarmayı başardılar. Karşılaştıkları hayvanın omuz yüksekliği altı metre, ağırlığıysa 20 ton kadardı. Bu yüksekliğin yanında sahip olduğu uzun boyun, araştırmacılara Baluchitherium'un yükseklerdeki yaprak, filiz ve ağaç dallarına özelleşmiş bir diyetle beslendiğini işaret ediyordu. Çalışmalar sırasında Baluchitherium dışında bulunan su kaplumbağası, çeşitli sürüngen türleri, timsahlar, diğer küçük gergedan türleri ve küçük boyutlu gevişgetirenlere ait fosiller, [illegible] milyon yıl önce aşırı nemli, tropik bir iklime sahip [illegible] ediyordu. Doğal olarak bu özelliklere sahip bir ortam, Baluchitherium için uygun besin teşkil edecek bitkilere de sahip olacaktı. Peki ortam bu derece elverişli idiyse, bu dev memeli ne zaman ve neden yok oldu?

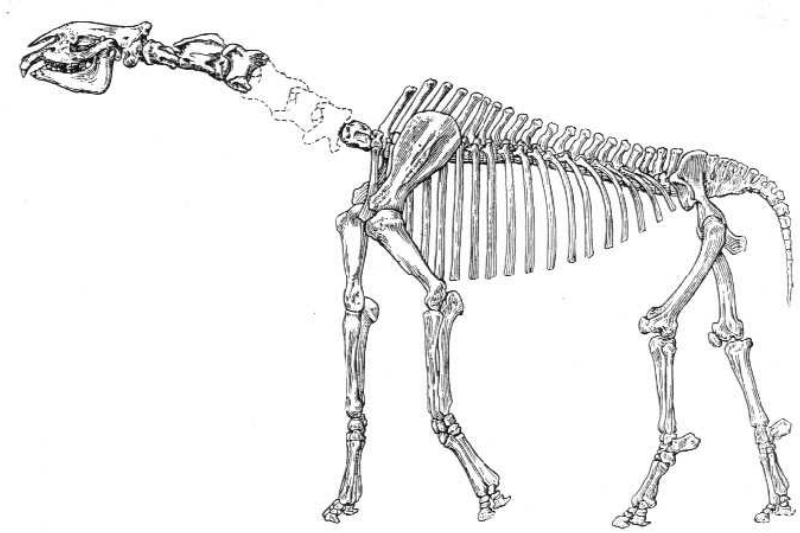
Bunu açıklayabilmek için biraz daha geçmişe gitmek gerekiyor... Yaklaşık 100 milyon yıl önce, güneyde bulunan süperkıta Gondwana, kendi içinde ayrılmaya başladı. Bu ayrılmayla birlikte Hindistan Yarımadası, Hint Okyanusu boyunca kuzeye doğru ilerledi. 55 milyon yıl önce Hindistan Yarımadası, Asya levhasına çarptı ve çarpışmanın sonucu olarak milyonlarca yıl süresince bu levhanın altına doğru kaydı. Tüm bu hareketler sonucunda Himalayalar oluştu. Bu büyük dağ zincirlerinin altında verimli vadiler yavaş yavaş kendini gösterdi. Yaklaşık 33 milyon yıl önce uygun ortamın oluşmasıyla da Baluchitherium tam bu bölgede ortaya çıktı. Sıcak ve nemli iklimle birlikte verimli tropikal ormanlar, bu dev memeli için mükemmel bir yaşam alanı sunuyordu. Fakat yaklaşık 28 milyon yıl önce başlayan tektonik hareketler nedeniyle bölgenin iklim ve bitki örtüsünde görülen değişimler, Baluchitherium için güzel olan tabloyu yavaş yavaş bozdu. Sıcak ve nemli iklim kurumaya başladı. Yeni iklime dayanıklı canlılar ortaya çıktı. İklim ve bitki örtüsündeki değişimler ve yeni canlılarla rekabet, zamanla Baluchitherium'un sonunu getirdi. Nitekim, Belucistan'da yapılan incelemeler, 33 milyon yıl önce ortaya çıkan bu dev memelinin, 11 milyon yıl hüküm sürdükten sonra, yani 22 milyon yıl önce silindiğini ortaya koydu.

Oligosen döneminde Anadolu hakkında çok önemli bilgileri gözler önüne seren sözkonusu proje halen devam ettiğinden, bulunan fosillerin bilimsel incelemeleri de henüz tamamlanmış değil. Doğa tarihinin paha biçilmez birer üyesi olan bu buluntular temizlendikten, teşhis edildikten ve gerekli ölçümleri yapıldıktan sonra, MTA Doğa Tarihi Müzesi'nde, Anadolu'nun geçmişinde yaşamış olan bu dev memeliyi merak eden herkesle buluşmayı bekleyecek.

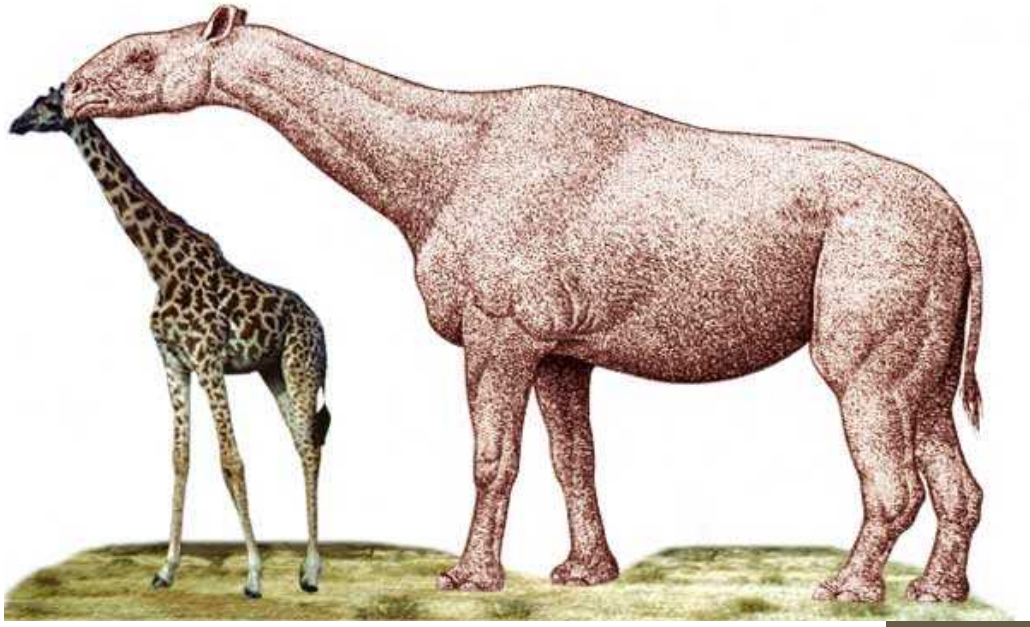
Aceratherium gaimersheimense
Baluchitherium sp.
Protaceratherium albigense
Paraceratherium sp.

Late Oligosen

Baluchitherium (Rhinoceros)



(6 metre)



Kırıkkale-Delice-Gözükızıl
Late Oligosen

Early Miocene(MN1-MN4)(23-16.2 My)

Ankara-Kılçak, Hancılı & Keseköy;

Manisa-Harta, Sabuncubeli, Kınık & Belenyenice; Aydın-Dededağ;

Konya'dan-Harami;

Çorum'dan-Kargı 2

Sivas-Horlak 1, 2

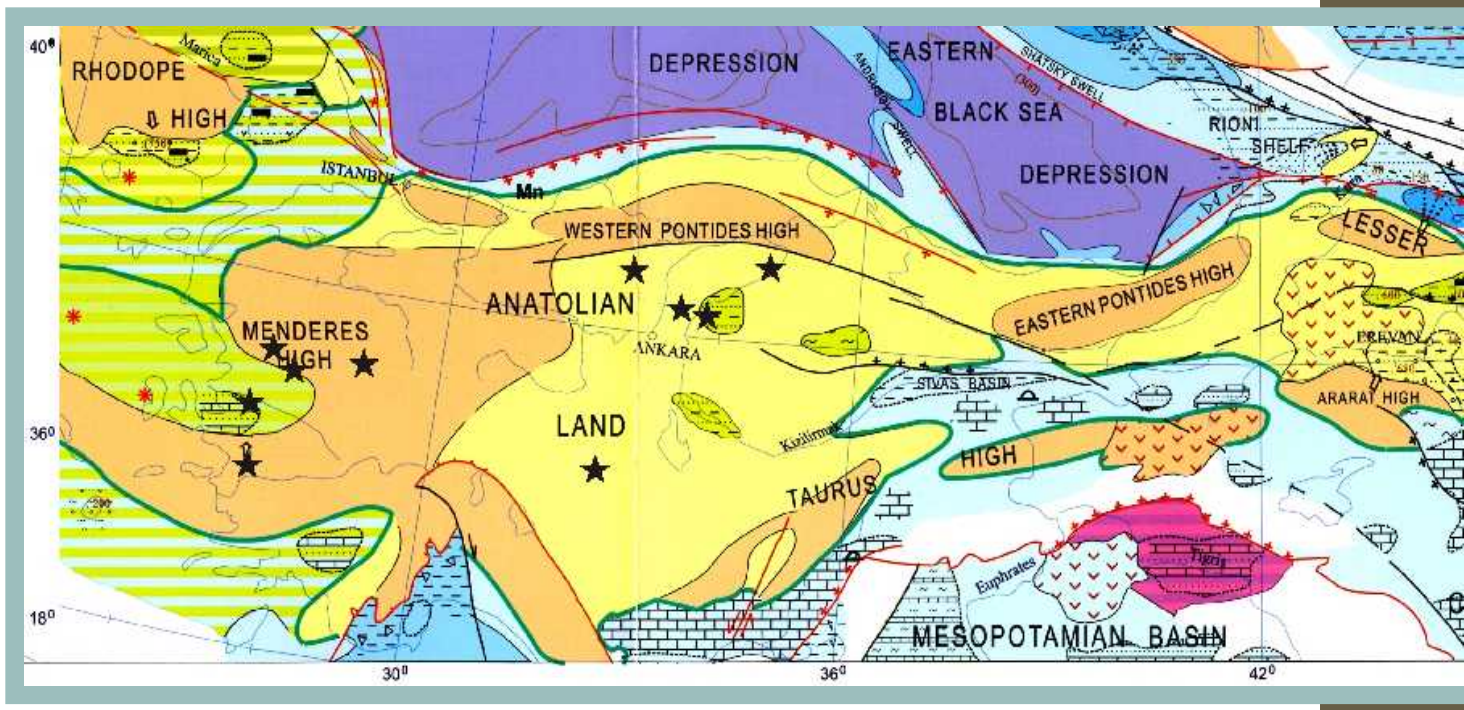
Aliveria,

Mirabella,

Eumyarion,

Deperetomys

Enginia



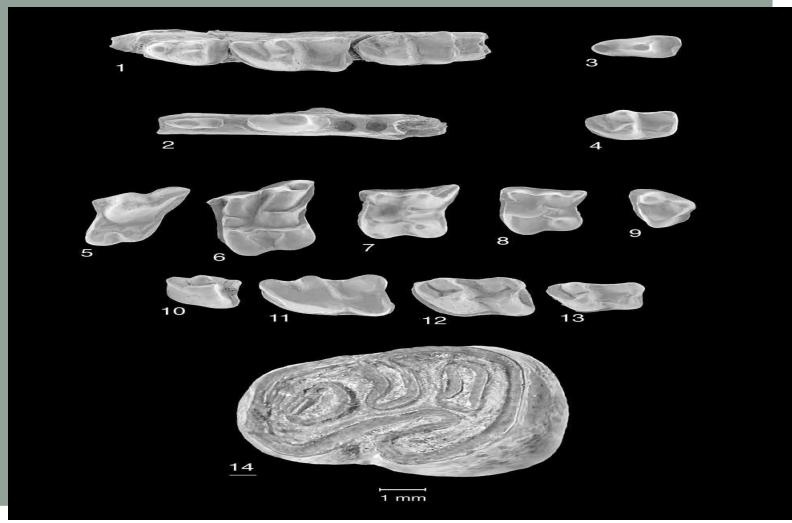
(Ünay et al,2003; Saraç 2003; Mayda, 2004).

Galerix uenayaei

Ordo: Erinaceomorpha GREGORY, 1910
Familya: Erinaceidae FISCHER von WALDHEIM, 1817
Alt familya: *Galericinae* POMEL, 1848
Genus: *Galerix* POMEL, 1848

Galerix uenayaei VAN DEN HOEK OSTENDE, 1992

Keseköy, Yapıntı , Harta, Sabuncubeli
Early Miocene (MN3)



Debruijnia arpati

Familya: Muridae ILLIGER, 1811
Subfamilya: Spalacinae GRAY, 1821
Cins: *Debruijnia* ÜNAY, 1996

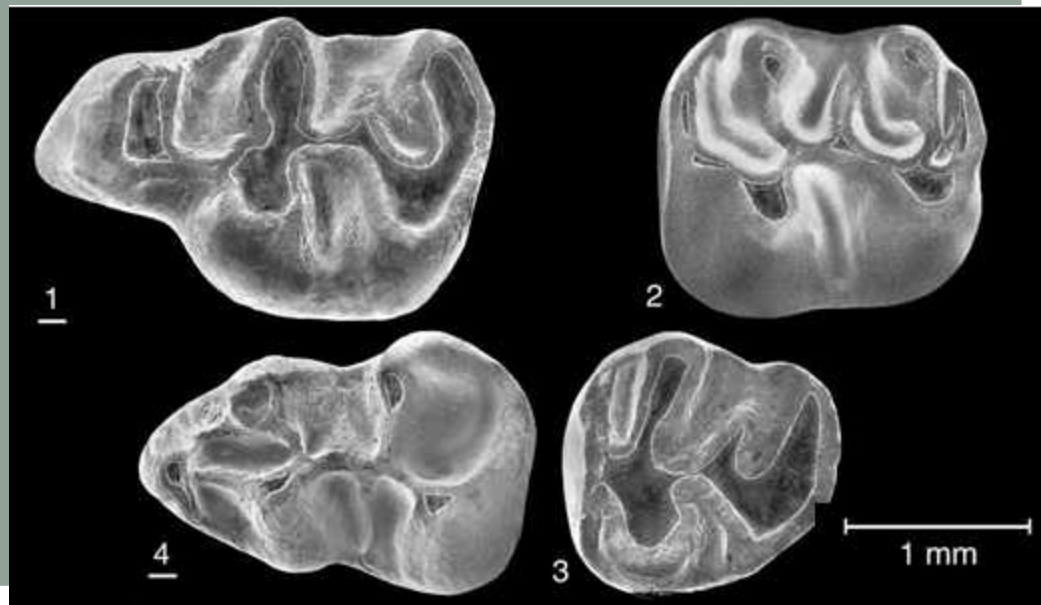
***Debruijnia arpati* ÜNAY, 1996**

Keseköy , Sabuncubeli (MN3)

Cricetodon kasapligili

Familya: Muridae ILLIGER, 1811
Subfamilya: Cricetodontinae STEHLIn et SHAUB, 1951
Genus: *Cricetodon* LARTET,1851
Cricetodon kasapligili de Bruijn et al., 1993

Keseköy, Bozalan, Harta, Sabuncubeli
Early Miocene (MN3)



Dorcatherium smyrnensis n.sp.

Subfamilya: Ruminantia Scopoli, 1777

Familya: Tragulidae Milne Edwards, 1864

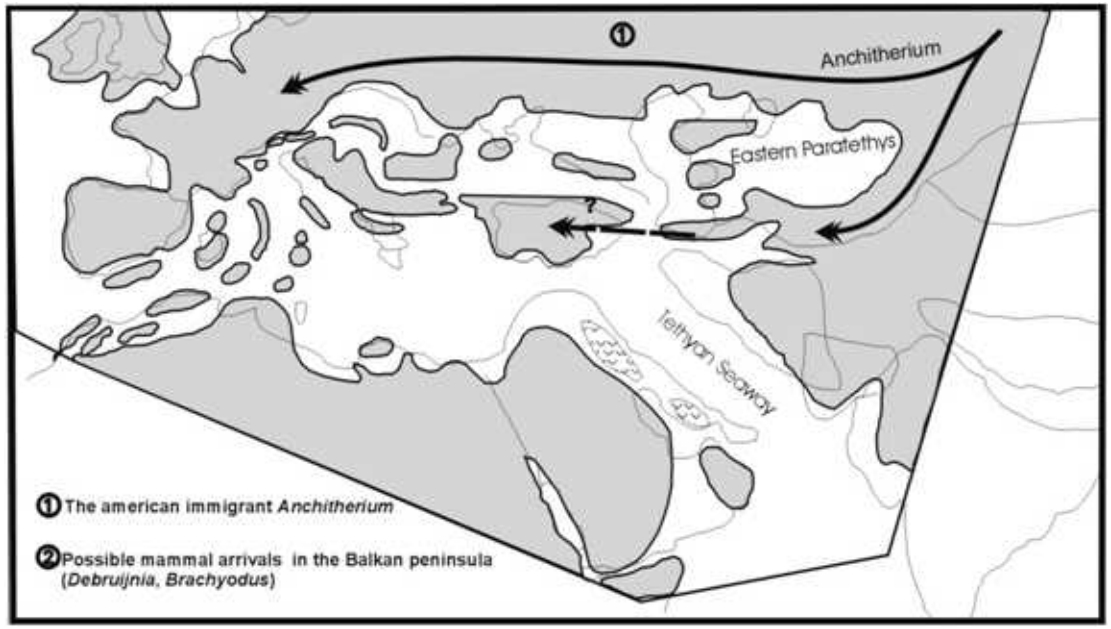
Genus: *Dorcatherium* Kaup, 1833

Dorcatherium smyrnensis n.sp.

Sabuncubeli -Manisa

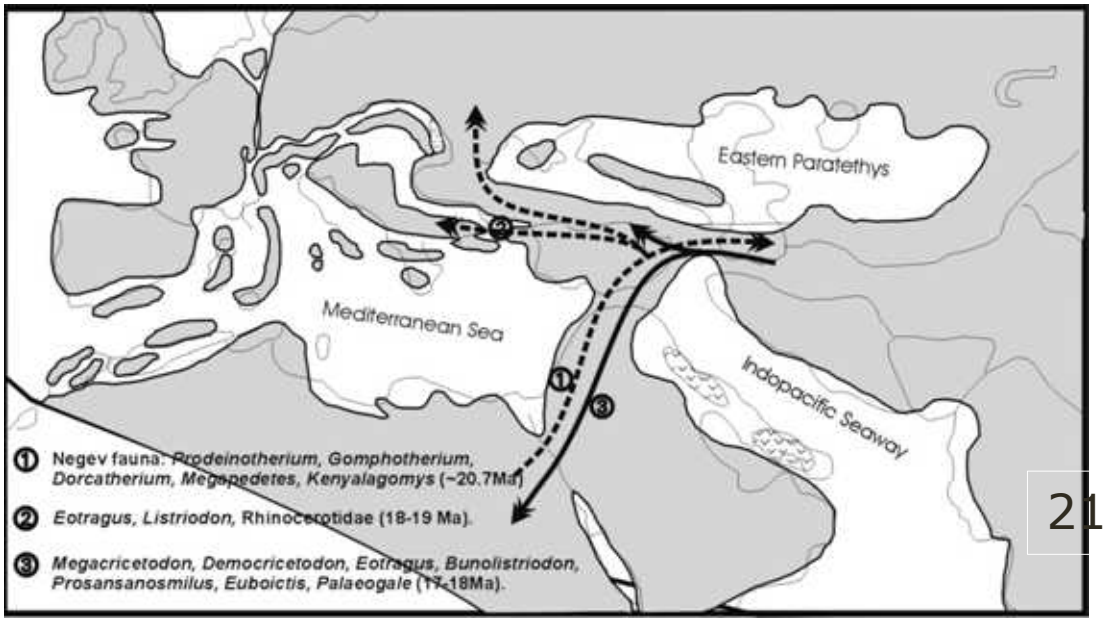
Early Miyosen (MN3)

Sol M_1-M_2 (MSB-201) (Holotip)



Early Orleanian (MN1-3)

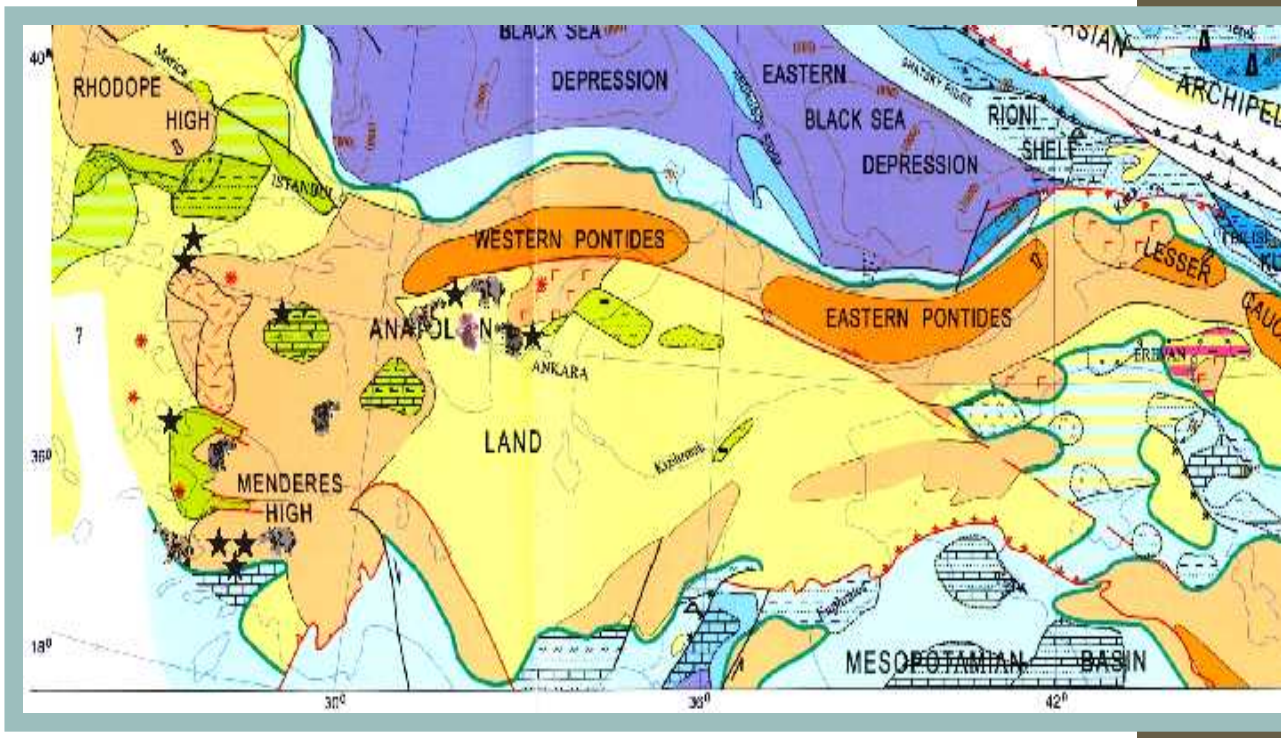
Middle Orleanian (MN4)



***Koufos et al.,2005.**

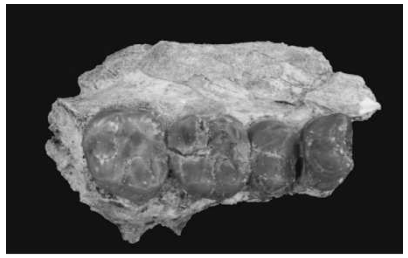
Bunol (İspanya), Erken Miyosen
Bunolistriodon (Suidae); Mesaceratherium (Boynuzsuz gergedan); Anchitherium (Equidae)
Gomphotherium (Proboscidea) ; Hemicyon (Carnivora).

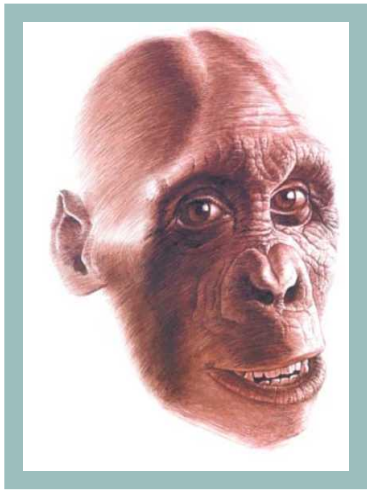
Middle Miocene (MN5-MN8)(16.3-11.8 My)

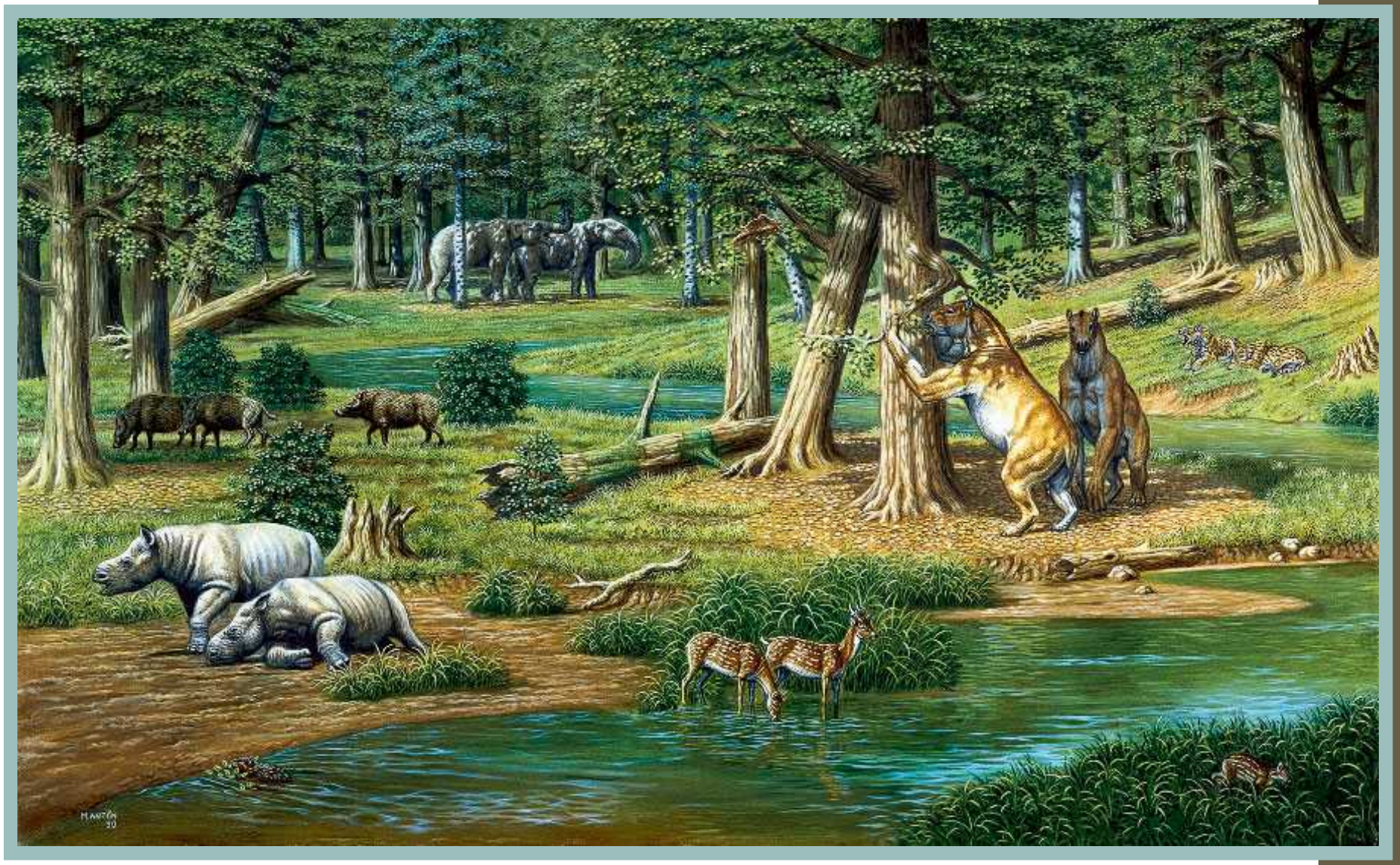


- Bursa-Paşalar,
- Ankara-Çandır
- İnönü 1,
- Çankırı-Tüney,
- Muğla-Ören,
- İzmir-Mordoğan,
- Çorum-Zambal,
- Kütahya-Sofça,
- Afyon-Yaylacılar,
- Muğla-Sarıçay, Çatakbağkaya
- Yenieskihisar,
- Çanakkale-Bayraktepe 1 & Nebisuyu

(Sickenberg et al.,1975; Ünay et al.i 2003; Kaya & Mayda 2011)

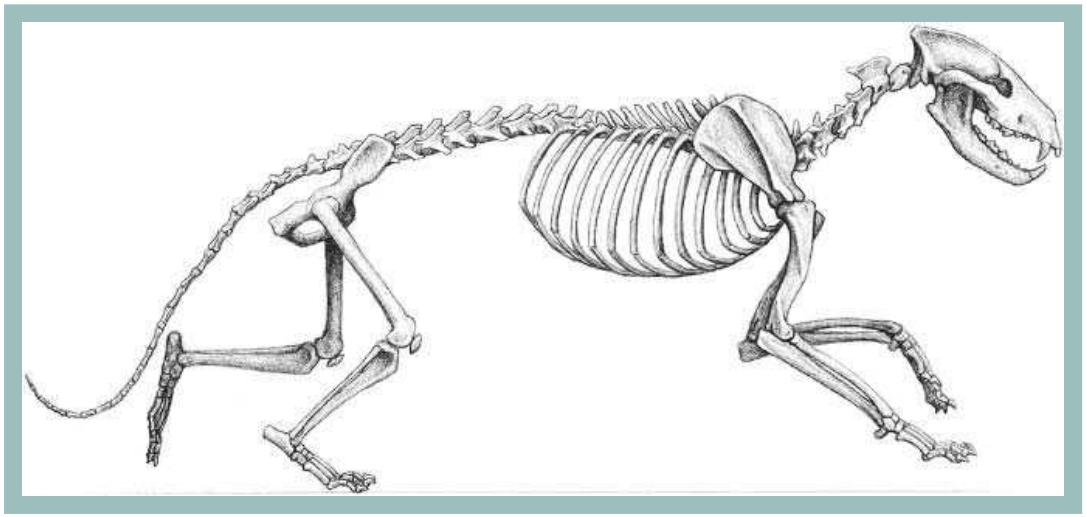




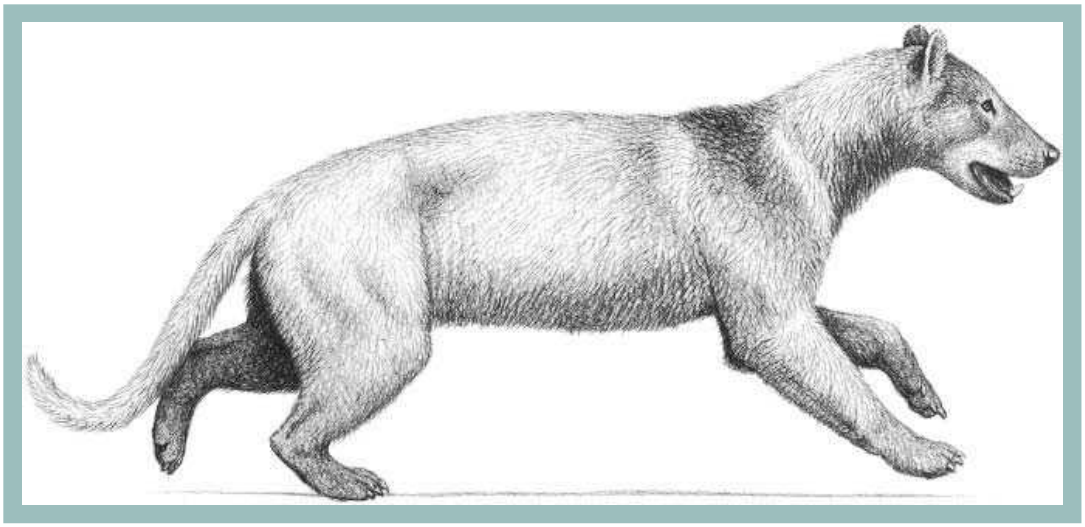


Middle Miyosen
Listriodon; Hoploaceratherium; Deinotherium; Chalicotherium; Sansanosmilus.

Amphicyon major



Amphicyon cf. major
BLAINVILLE
Aragoniyen
Bursa, Paşalar

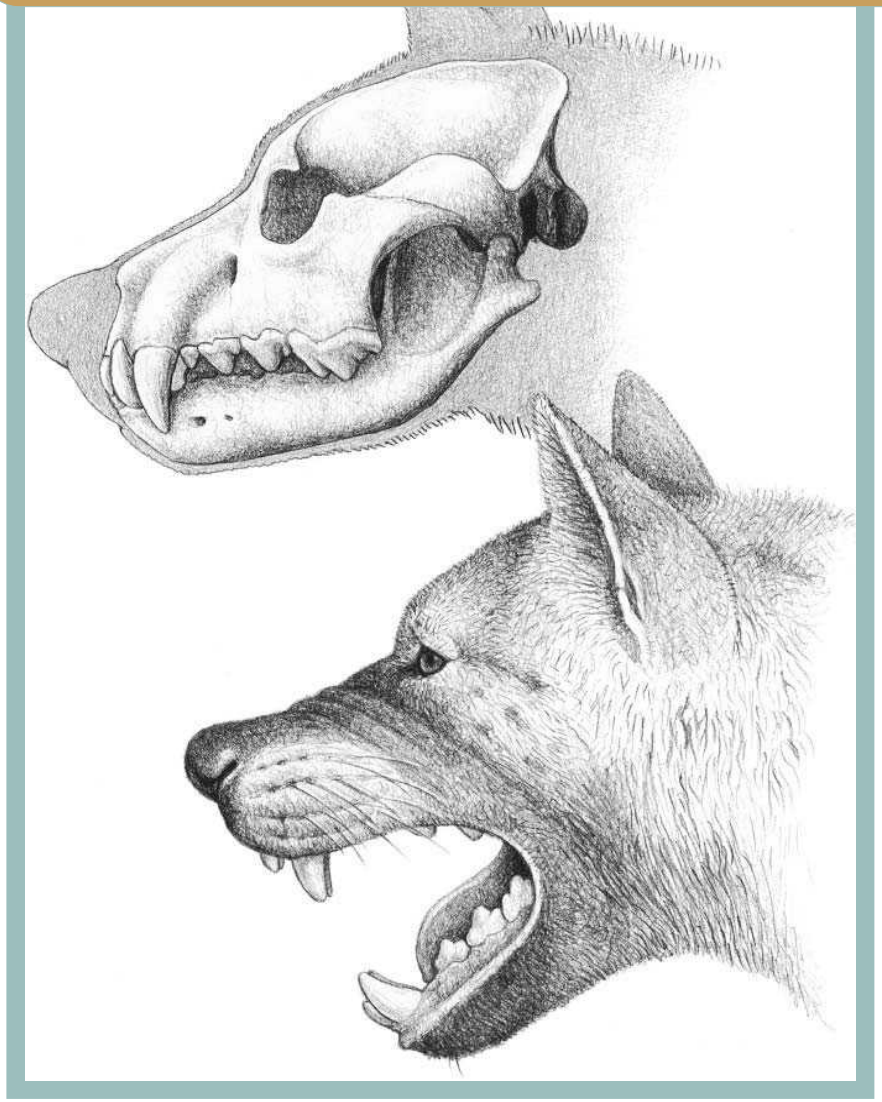


Paşalar & Çandır (MN 6)

Percrocuta, Hypsodontus, Protoanancus

İzmir-Mordoğan
(Middle Miyosen – MN5)

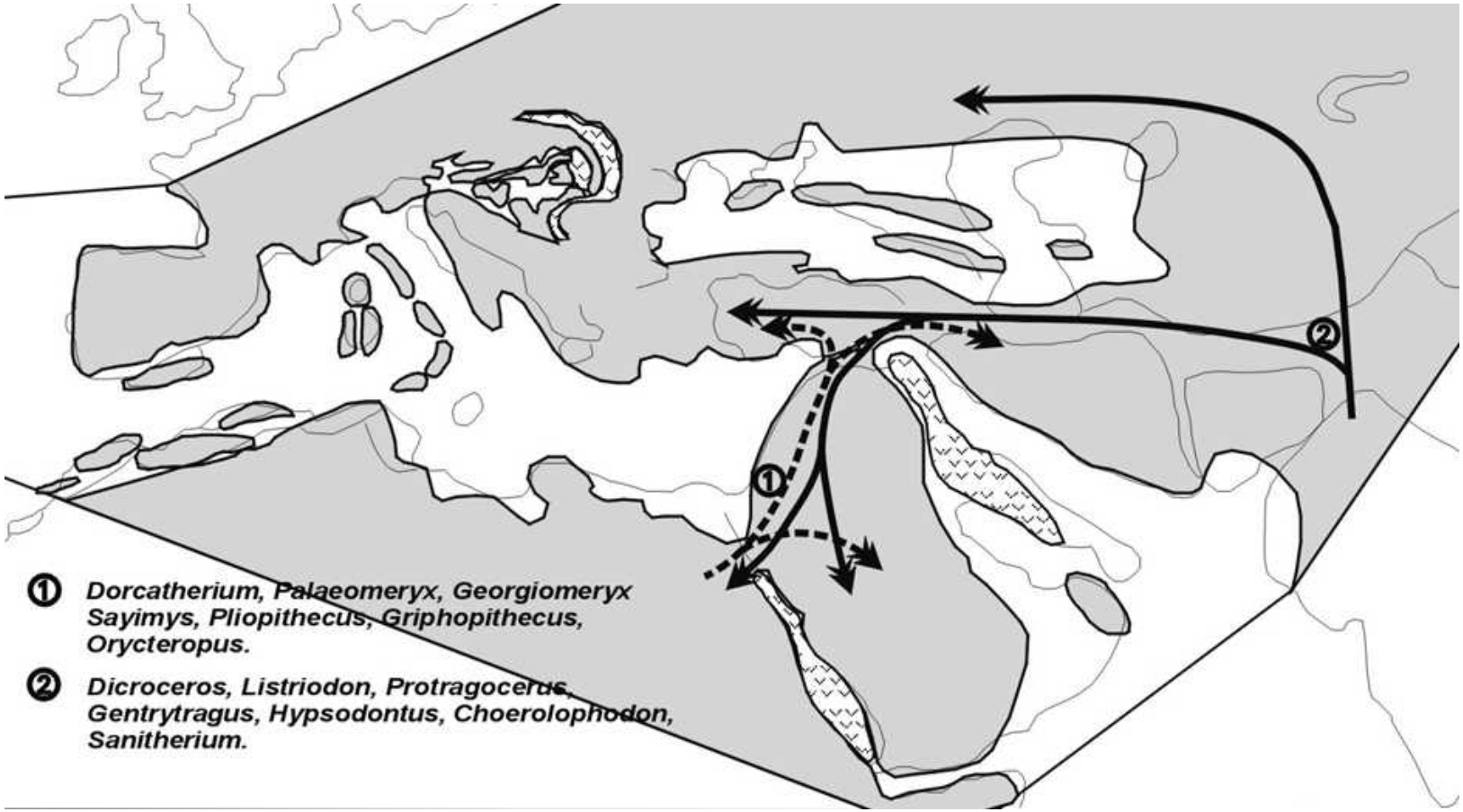
Percrocuta miocenica



Mordoğan-İzmir;
Çandır-Ankara
Orta Miyosen

Percrocuta miocenica

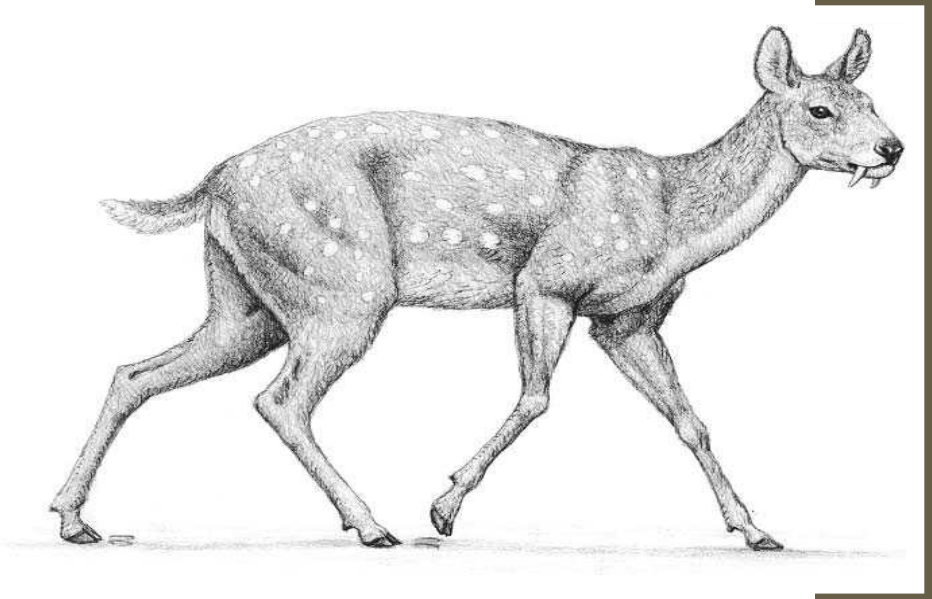
Percrocuta miocenica



Late Orleanian-Early Astaracian (MN5-6)

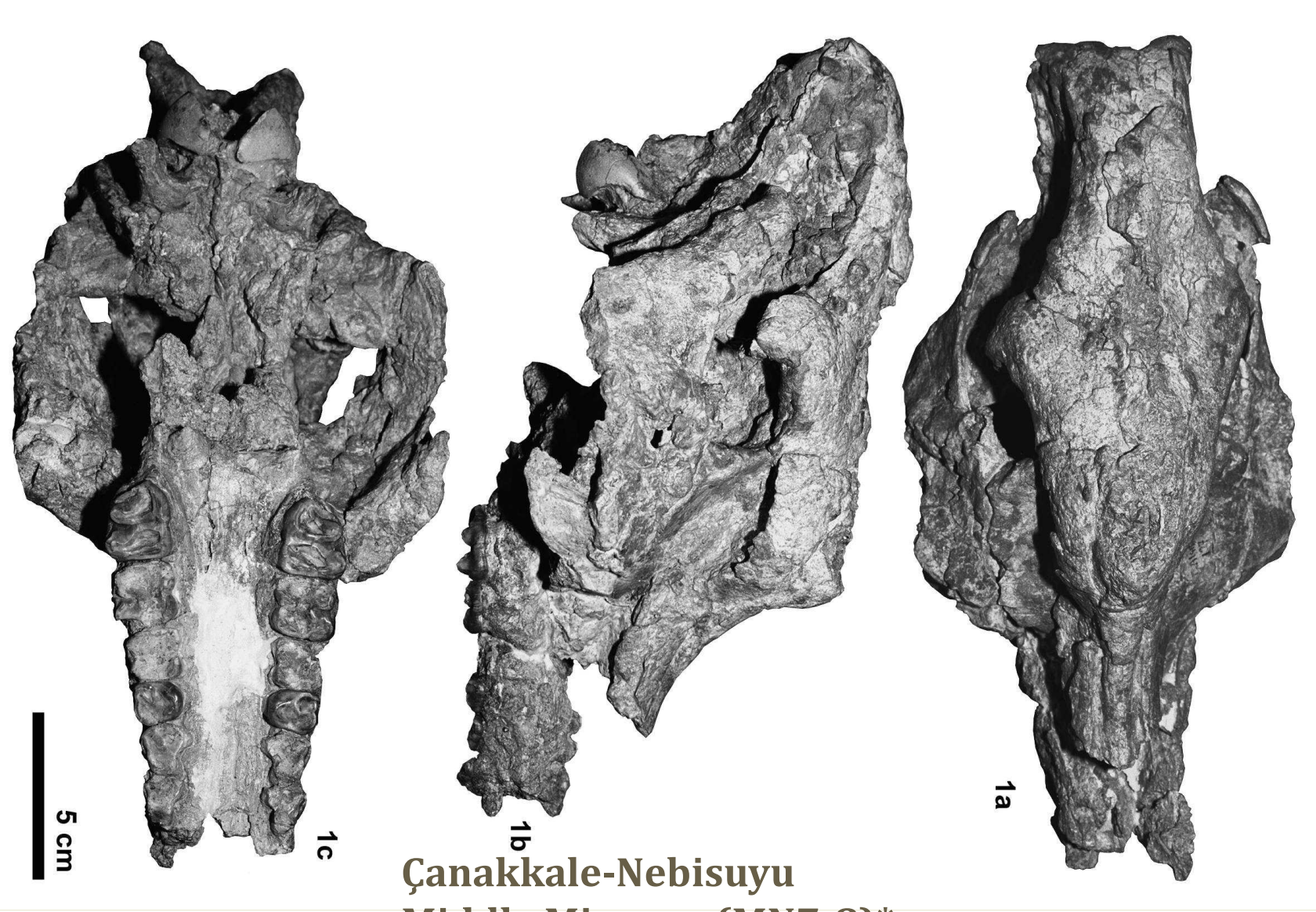
Koufos et al., 2005.

Micromeryx



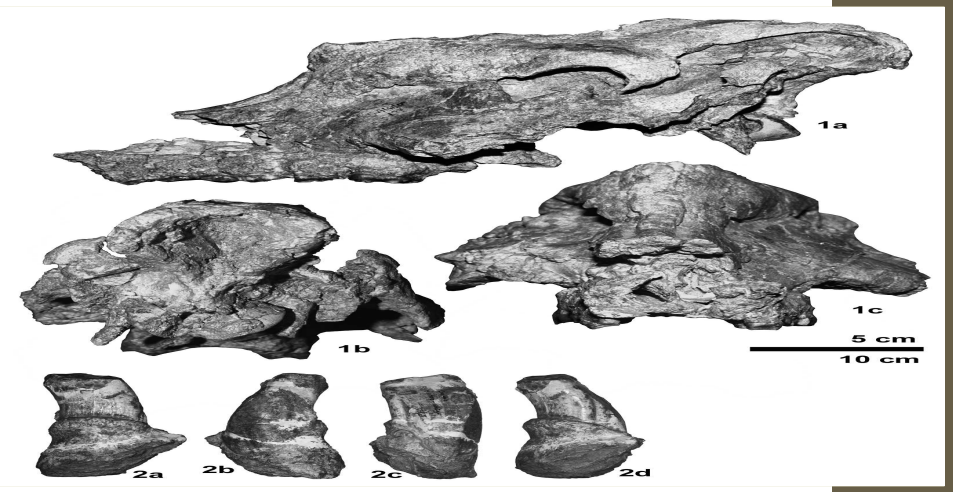
Orta Miyosen, Çandır

Listriodon splendens

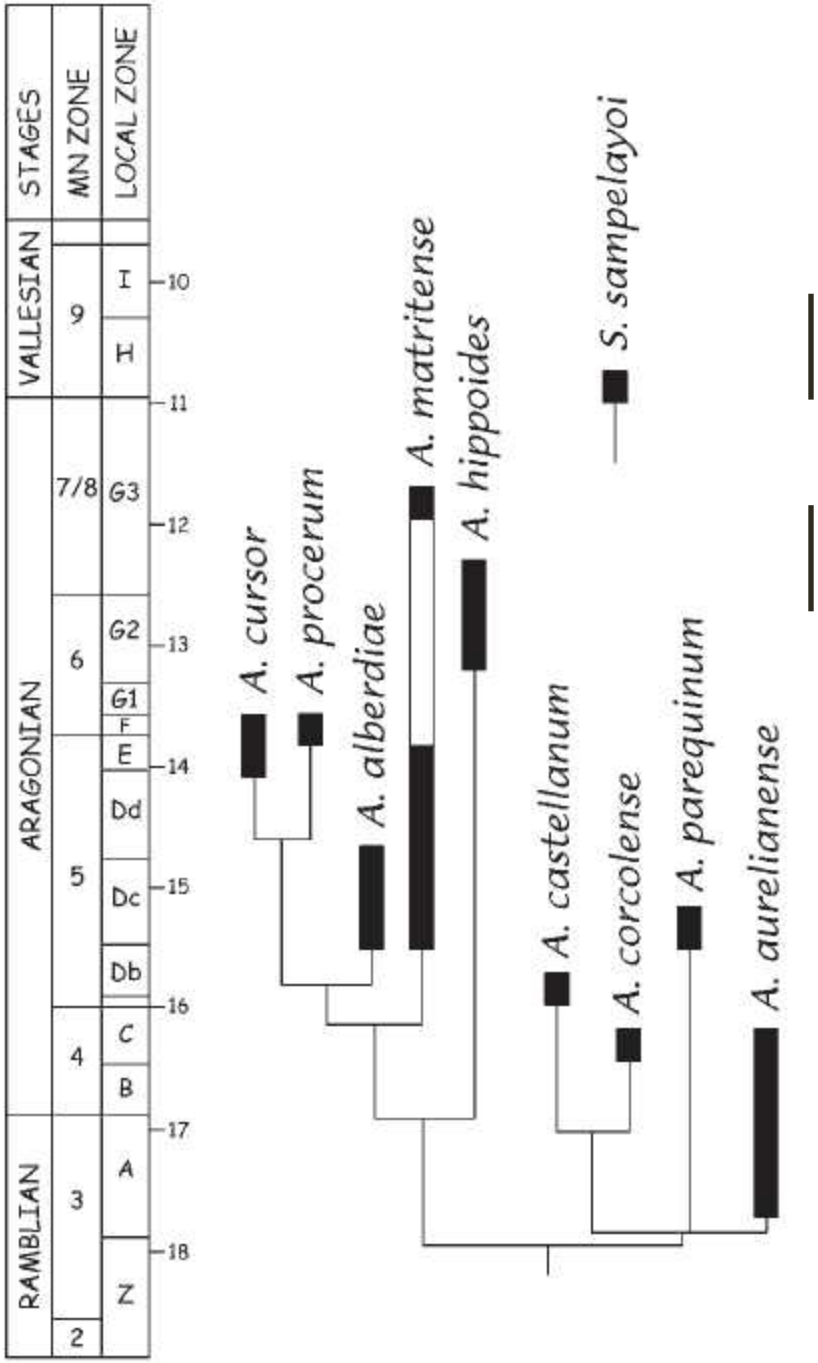


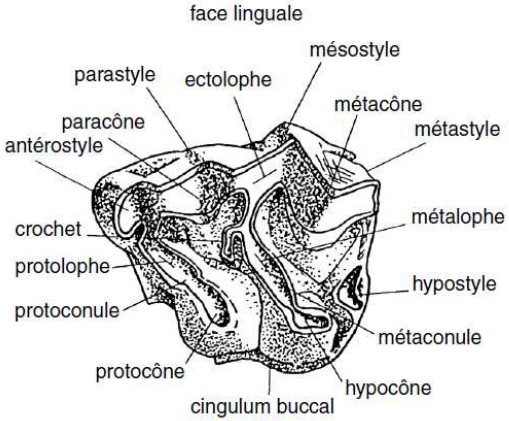
Çanakkale-Nebisuyu
Middle Miocene (MN7-8)*

Kubanochoerus gigas



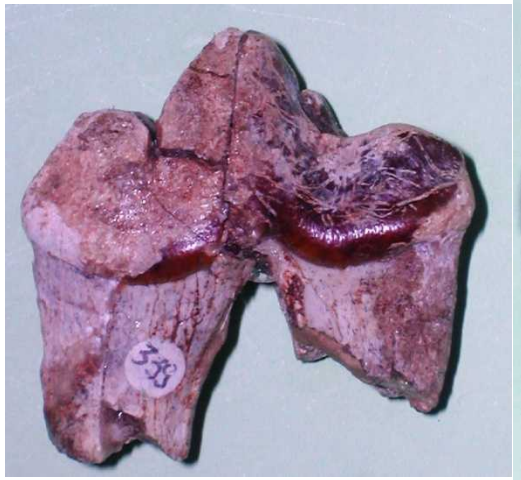
Çanakkale-Nebisuyu
Middle Miocene (MN7-8)*

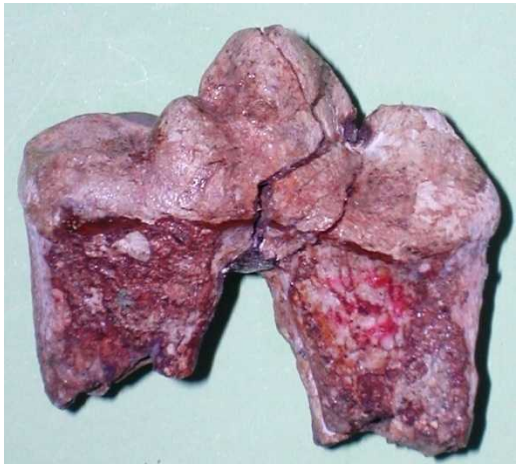




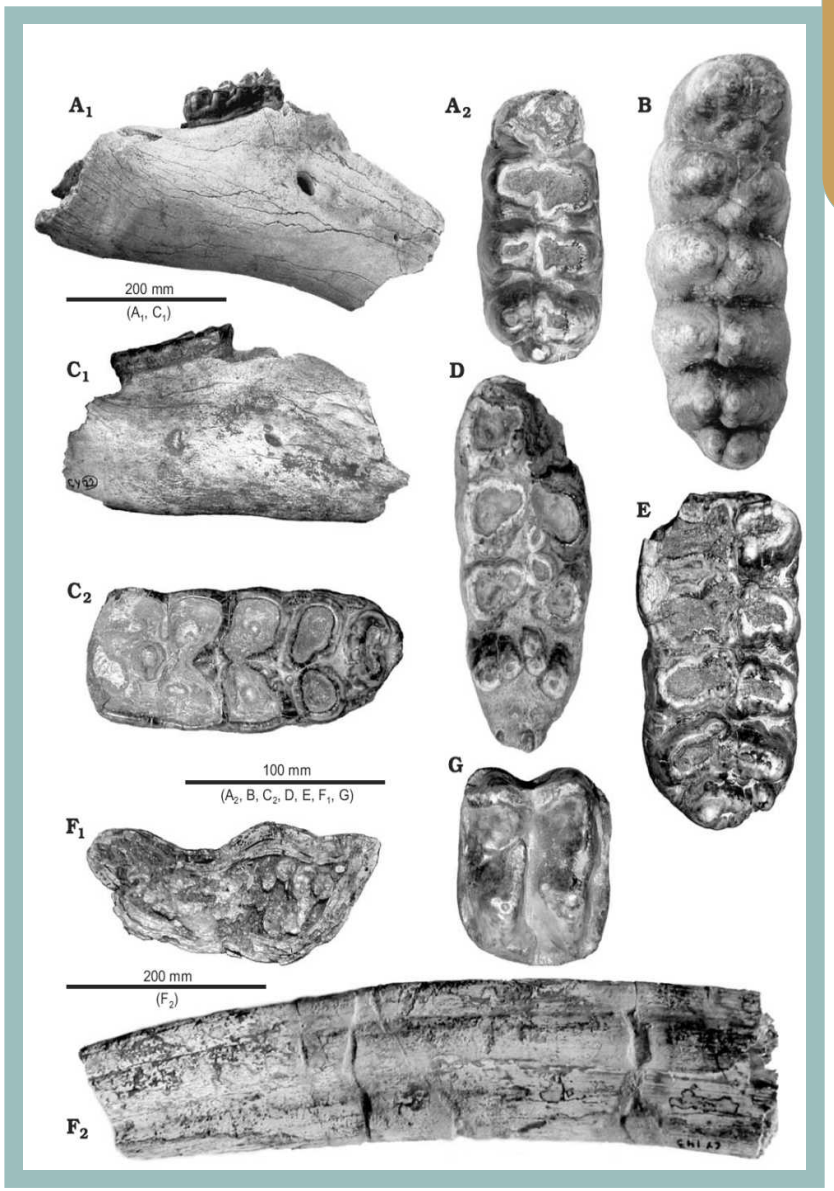
Sinohippus n.sp.

Hemicyon (Çanakkale-Nebisuyu)





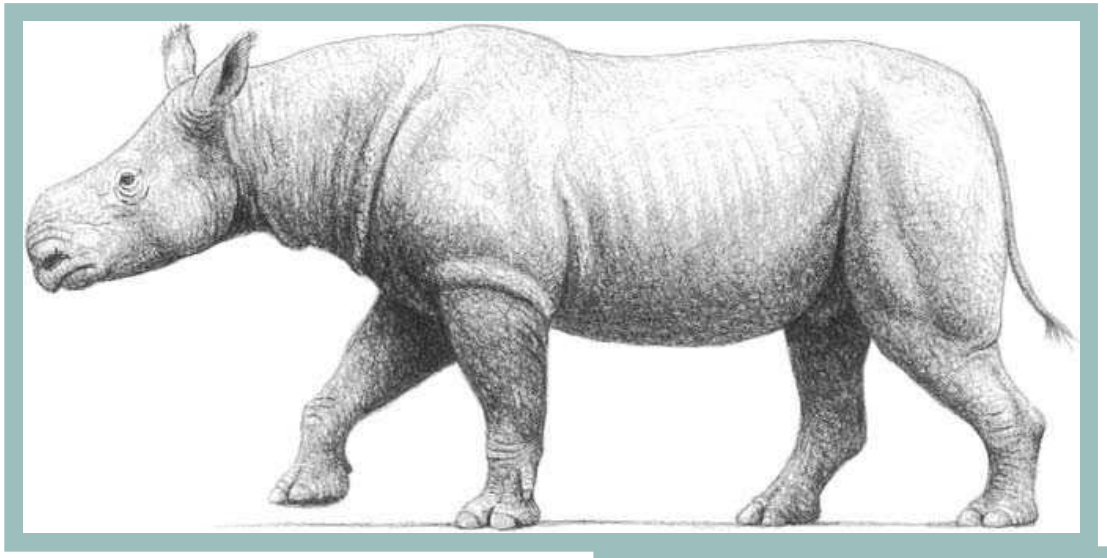
Late Miocene (MN9-MN13)

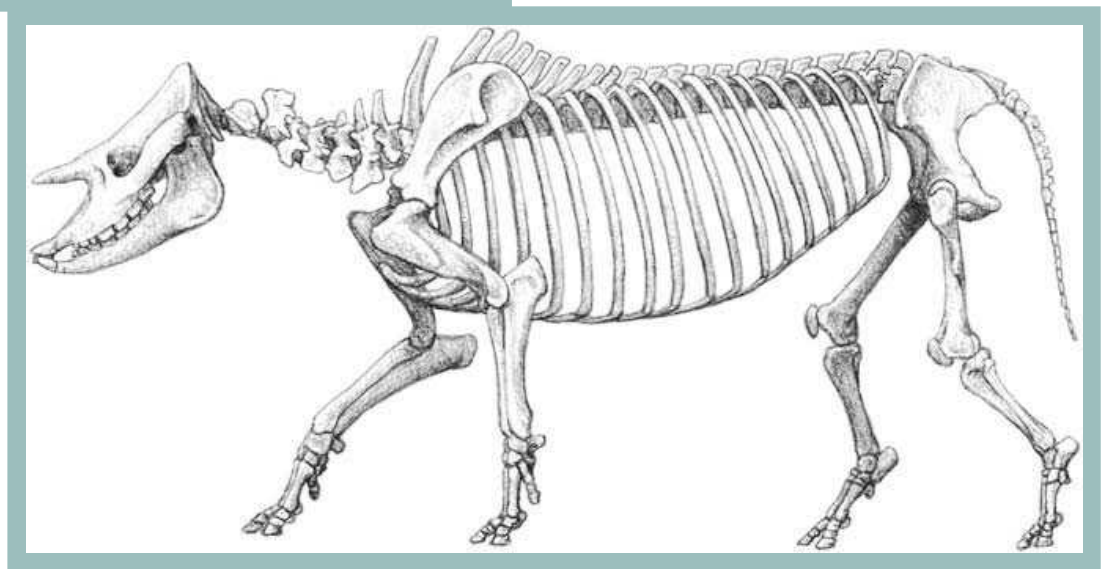


A, B. Tetralophodon longirostris
C, D. Choerolophodon anatolicus
E, F. Amebelodon grandincisivus
G. Deinotherium giganteum

Tekirdağ-Çorlu-Yulaflı
Late Miyosen
(Vallesian MN10)

Aceratherium incisivum





1-3. Aceratherium incisivum

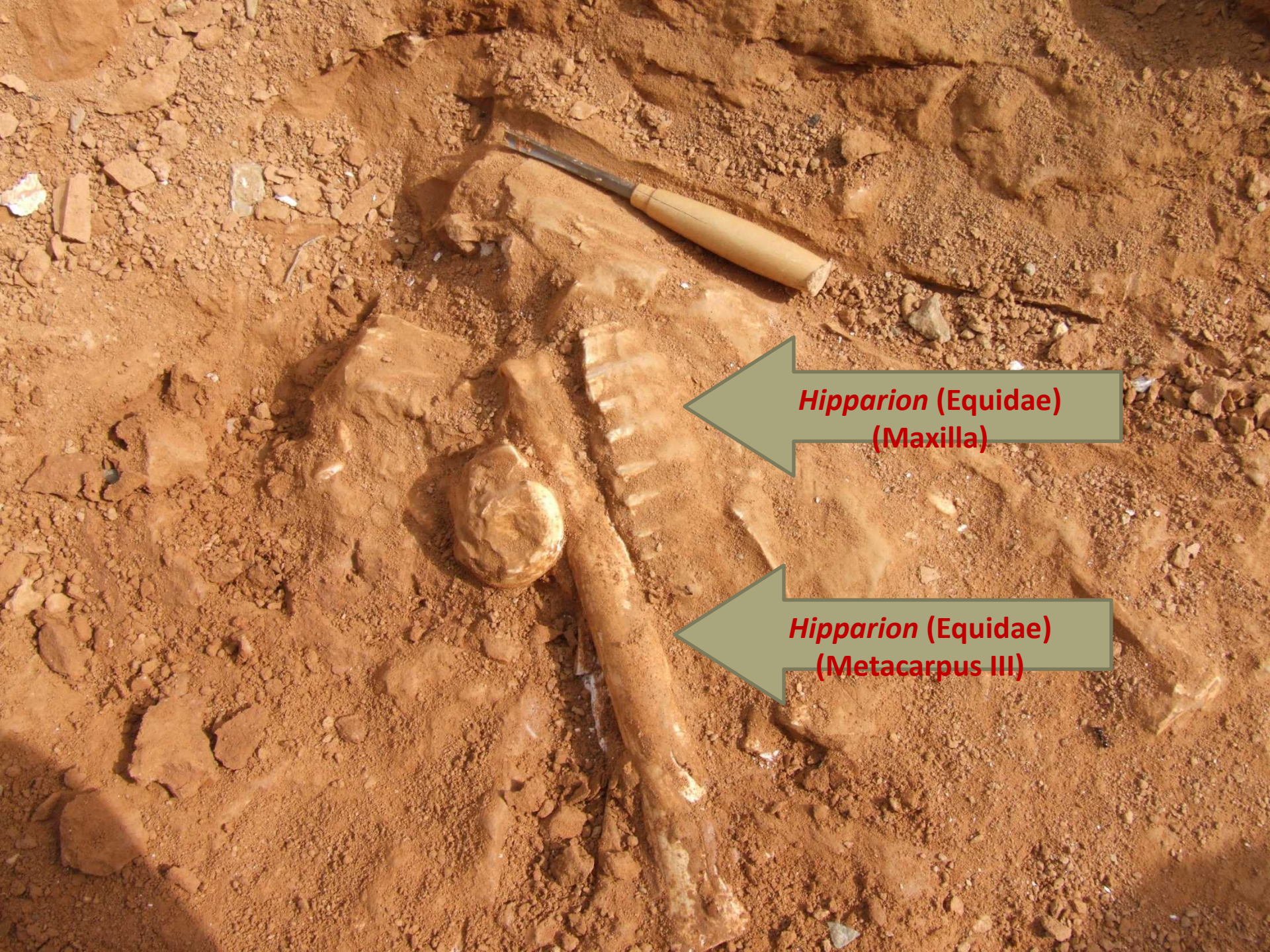
1

2

3

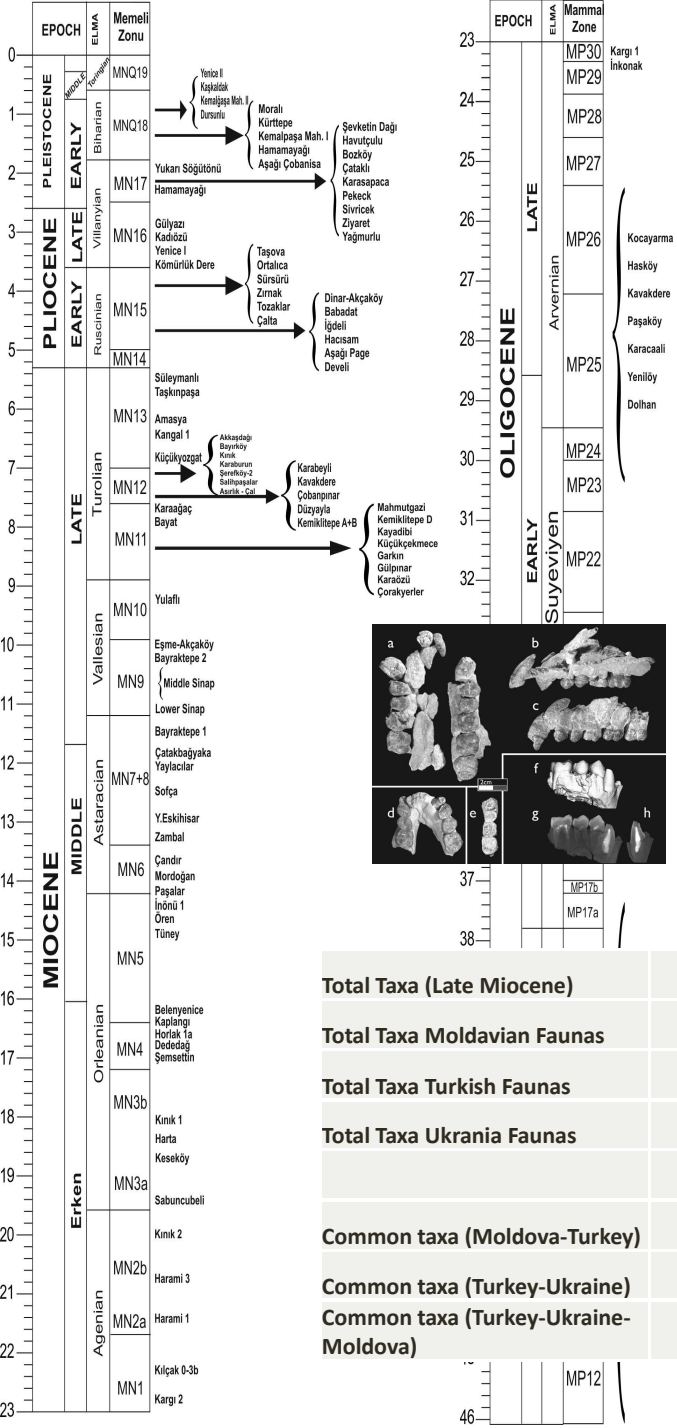
Tekirdağ-Çorlu-Yulaflı
Geç Miyosen (MN10)*


Yatağan-Şerefköy
Samotherium (Giraffidae)
(Calceneum)


Hipparion (Equidae)
(Maxilla)
Hipparion (Equidae)
(Metacarpus III)

Hipparion (Equid


Ceratotherium neumayri
(Rhinoceratoidea) (Tibia)
12 VINCENT VARKENSHAAR



Total Taxa (Late Miocene)	**276**
Total Taxa Moldavian Faunas	**120**
Total Taxa Turkish Faunas	**177**
Total Taxa Ukrania Faunas	**127**
Common taxa (Moldova-Turkey)	**33**
Common taxa (Turkey-Ukraine)	**27**
Common taxa (Turkey-Ukraine-Moldova)	**47**

Late Miocene (MN9-MN13)

Common Turolian Elements of Turkish Loclaities

Hipparion,

Ancylotherium,

Ceratotherium,

Chilotherium,

Ictitherium,

Machairodus,

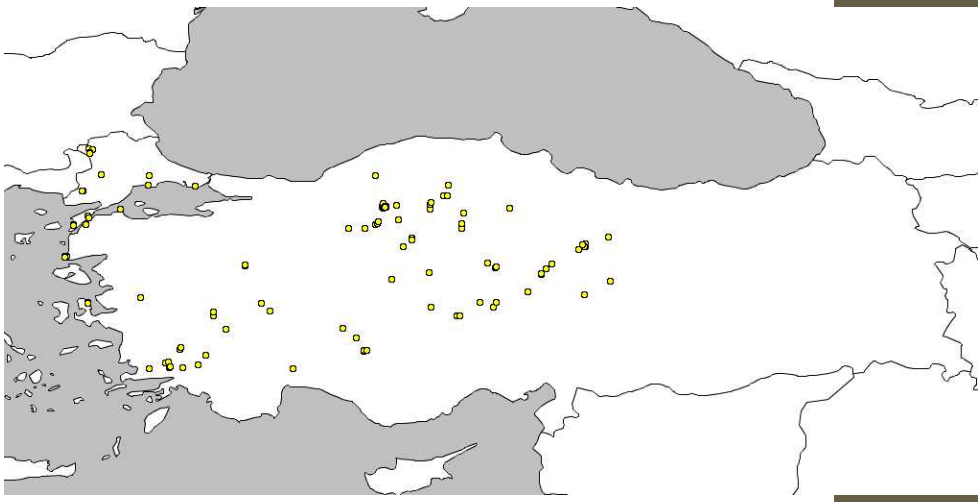
Microstonyx,

Choerolophodon,

Tetralophodon,

Palaeotragus and

Samotherium



Total Taxa (Late Miocene)	**276**
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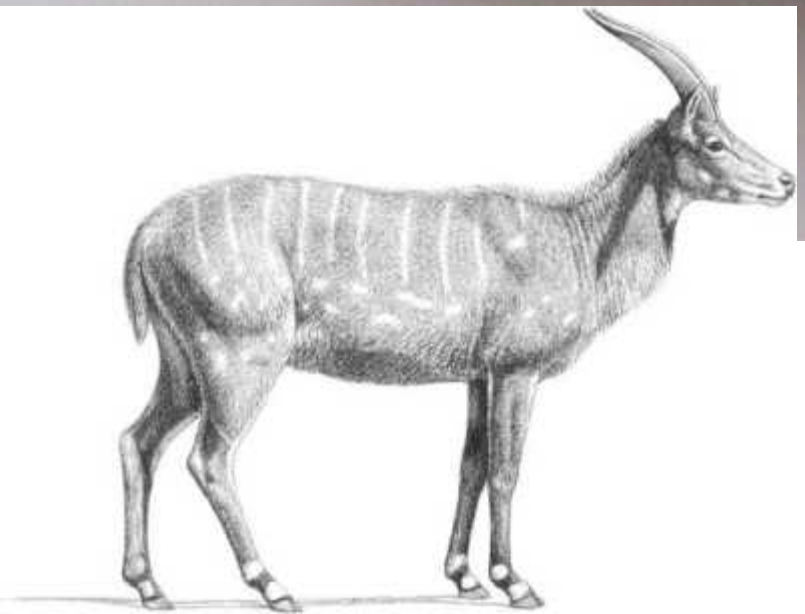
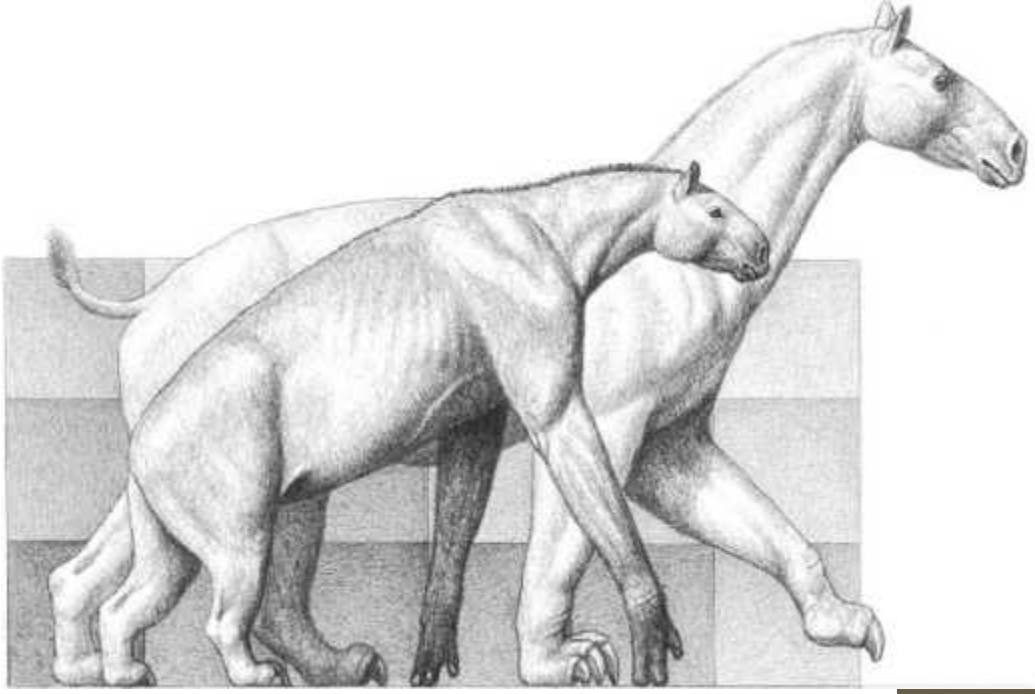
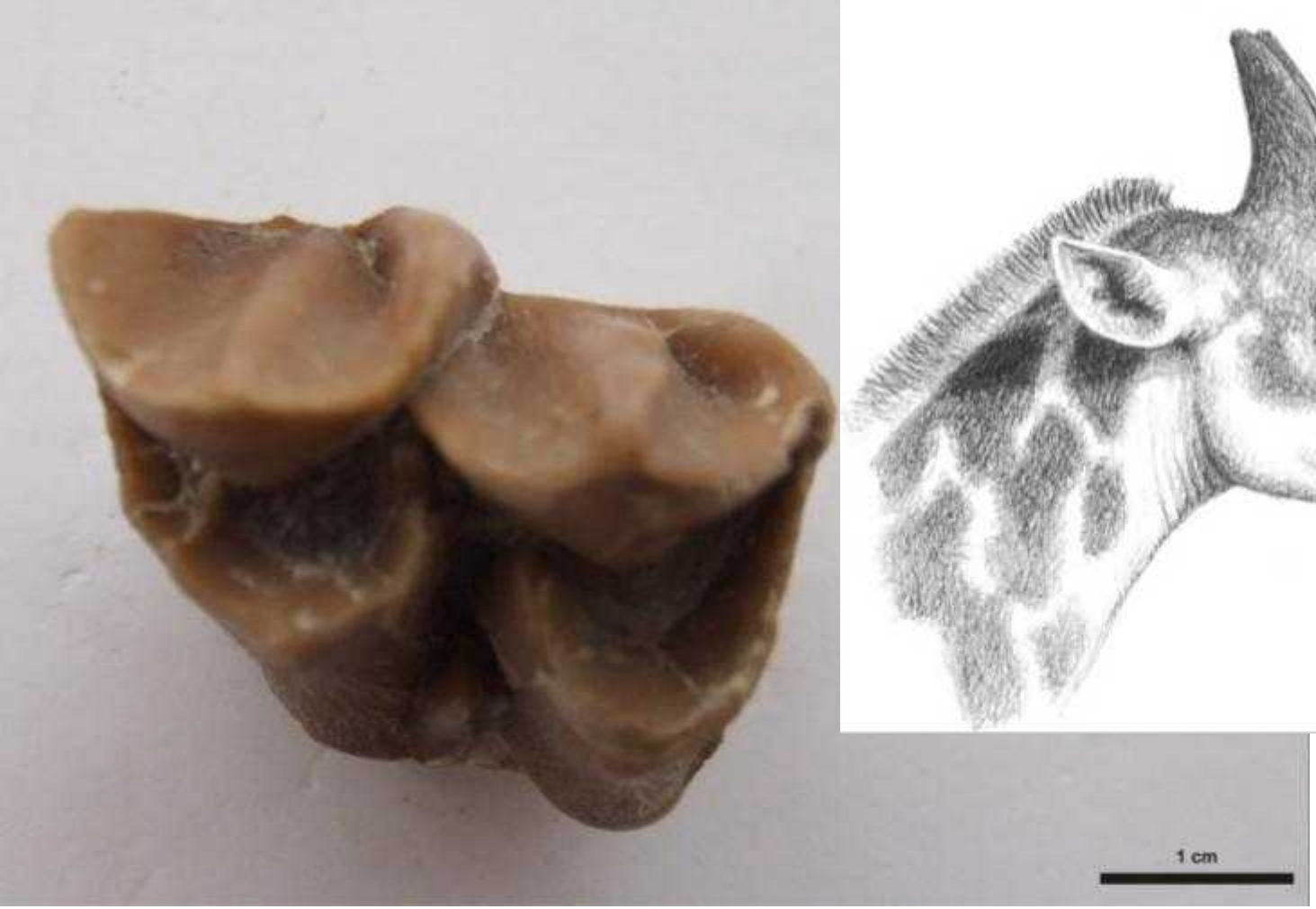
Total Taxa Russian	**127**
Common taxa (Moldavia-Turkey)	**33**
Common taxa (Turkey-Russia)	**27**
Common taxa (Turkey-Russia-Modavia)	**47**

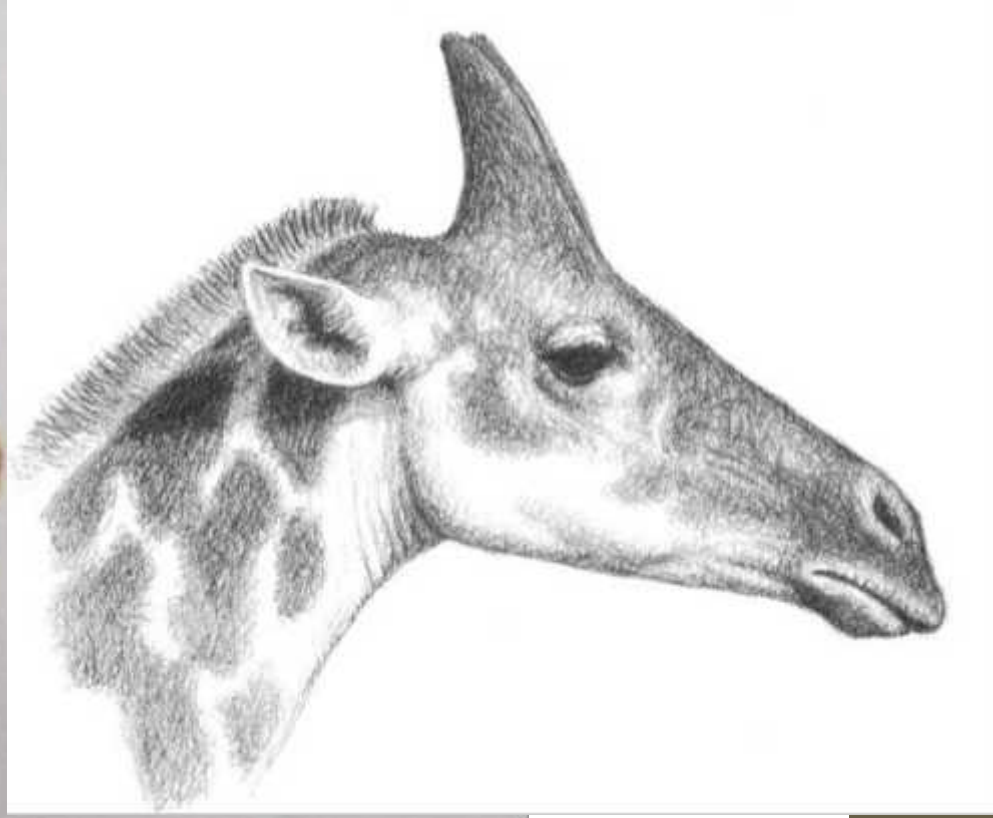


Miotragocerus gaudryi; Boynuz



Ancylotherium cf. *pentelicum*

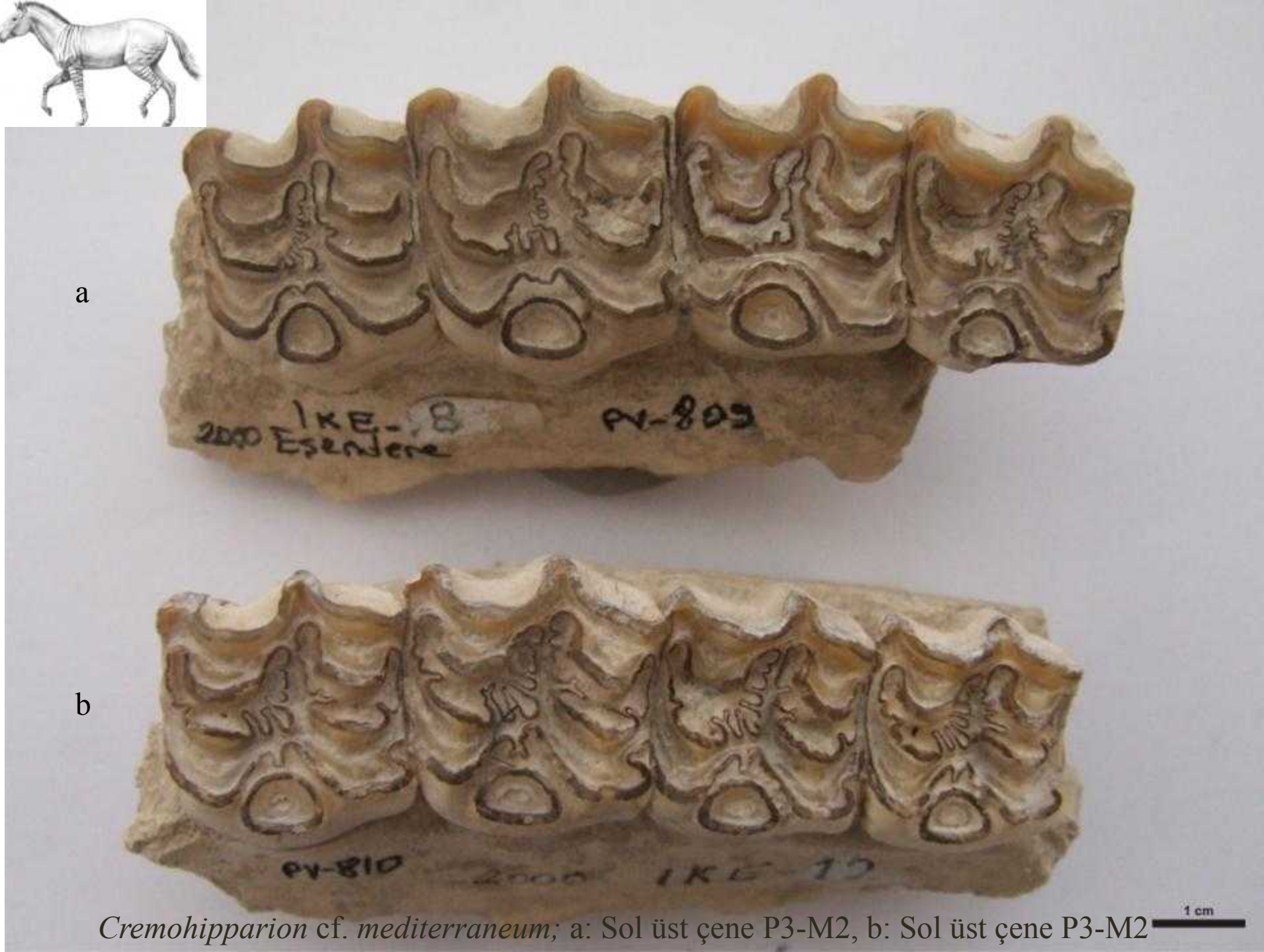




Bohlinia attica

a

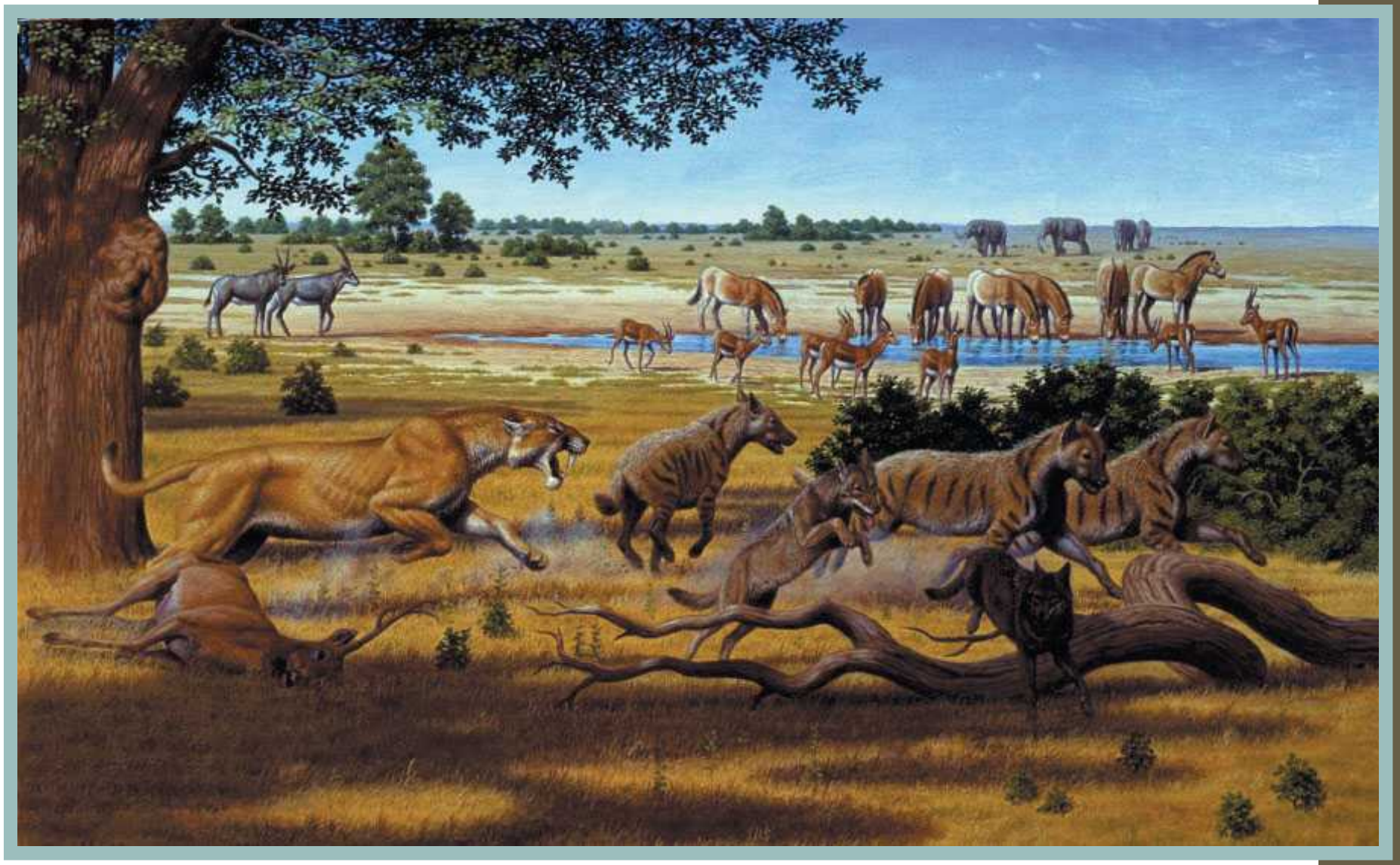
b



Cremohipparion cf. *mediterraneum;* a: Sol üst çene P3-M2, b: Sol üst çene P3-M2

Hipparion dietrichi

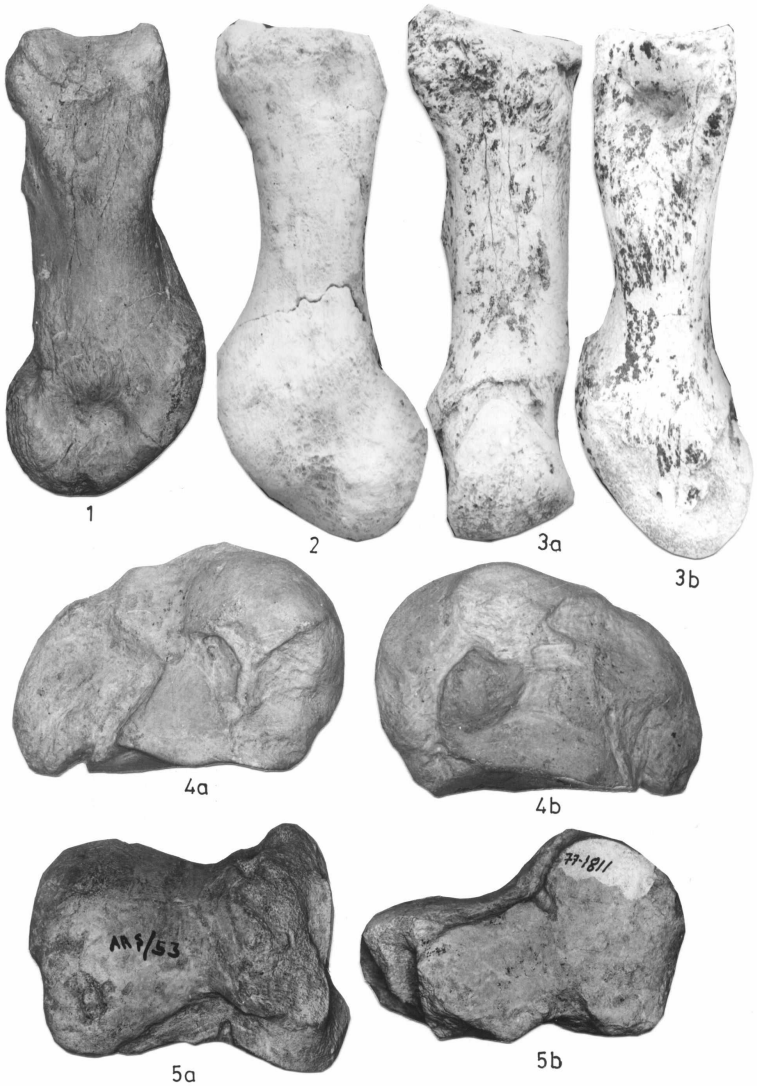
MYSE
PV-964
(cm) 0 1 2 3 4 5



Turolian - Turkey
Machairodus, Protoryx; Hipparion; Lycyaena; Tetralophodon.

Hipparion ancryanum
Middle Turolian
Ankara- Sinaptepe

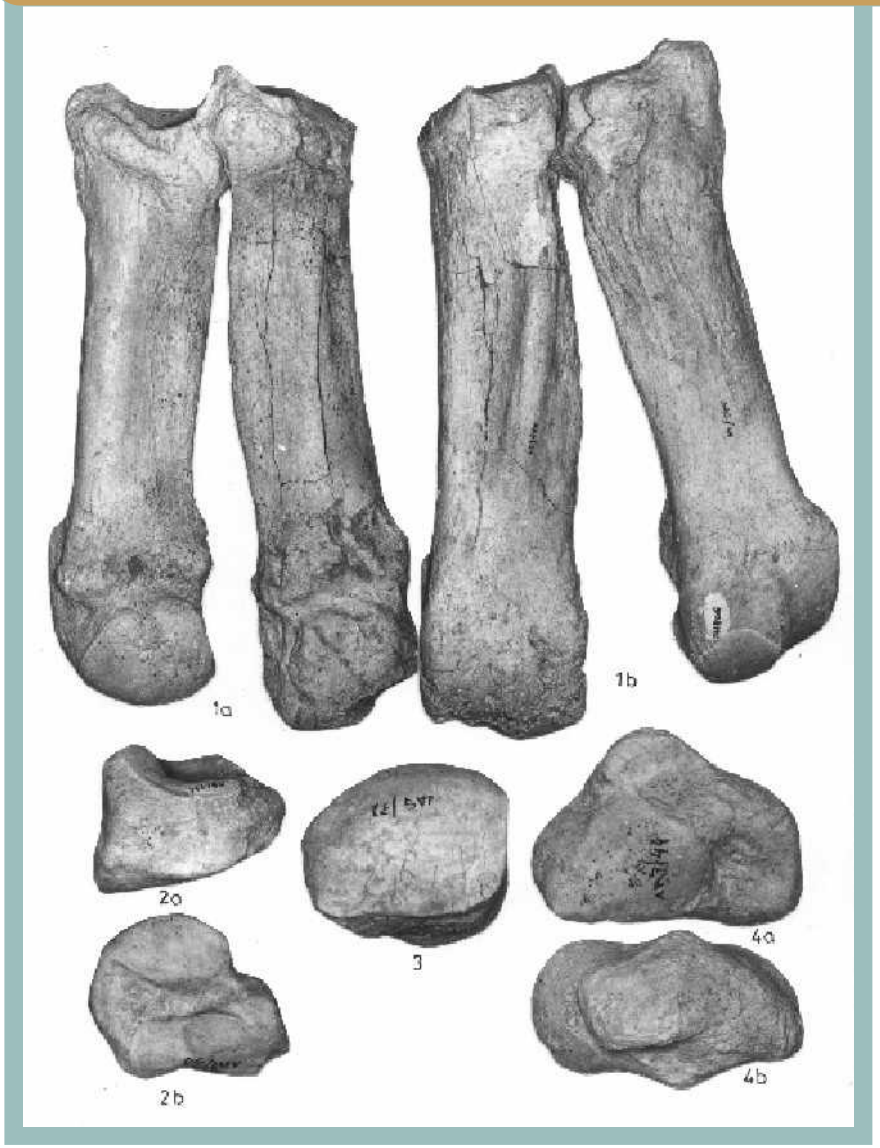
Ancylotherium pentelicum



Ankara-Ayaş-Pınarkaya
Late Miyosen (MN12)*

* Saraç, G., Kaya T. and Geraads, D. 2002. Ancylotherium pentelicum (Perissodactyla, Mammalia) from the Upper Miocene of central and western Turkey.Geobios, Volume 35, Iss 2, Pages 241-251

Ancylotherium pentelicum



Ankara-Ayaş-Pınarkaya
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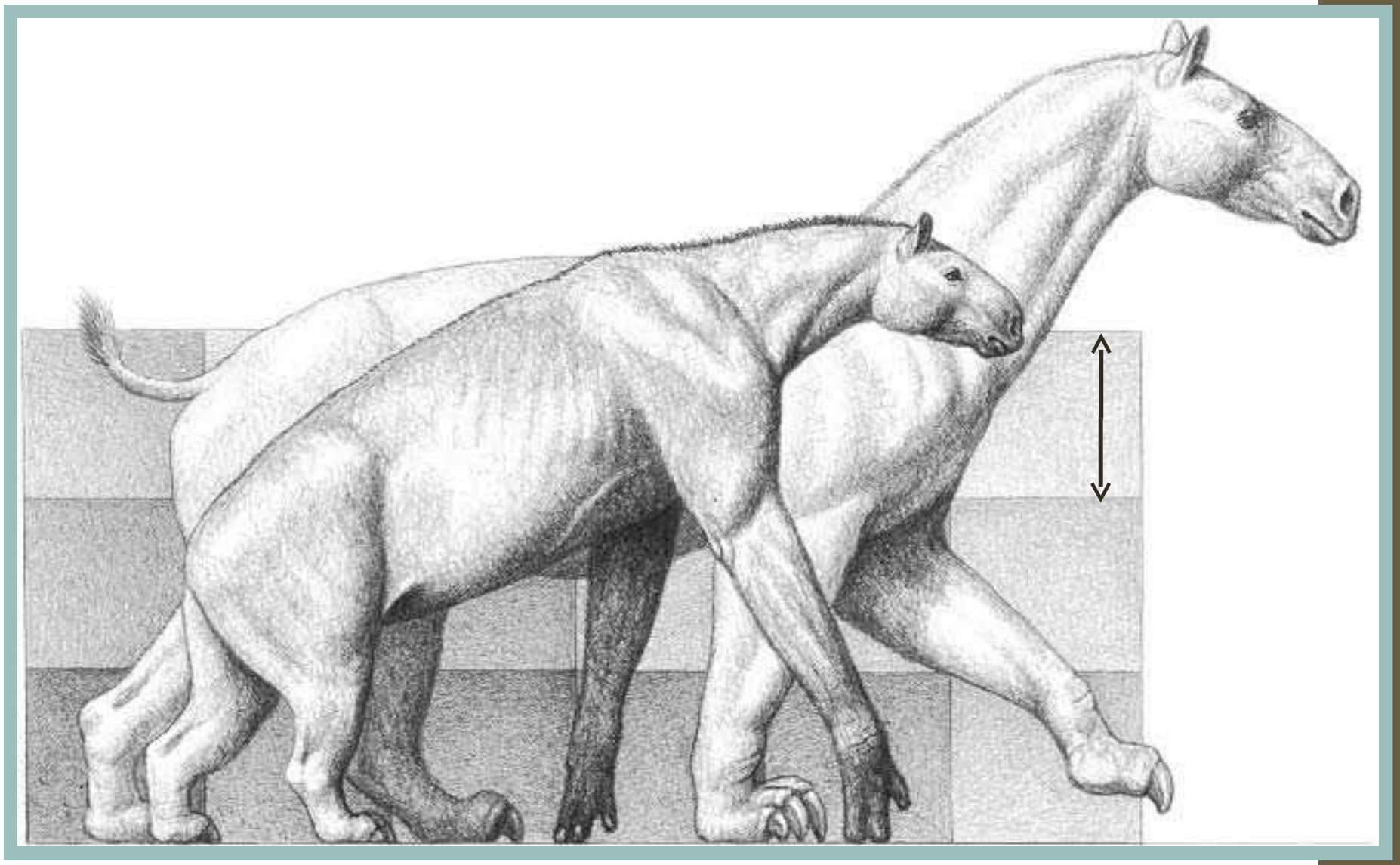
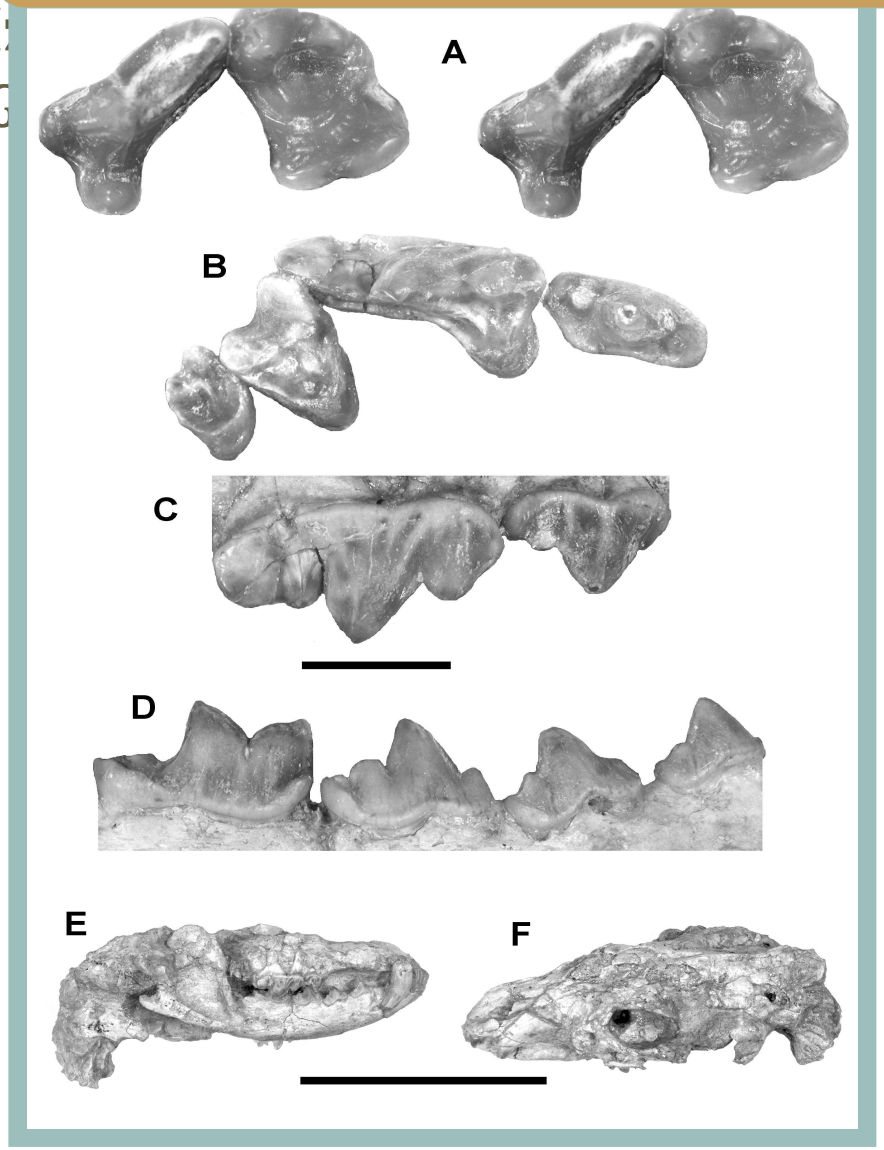
* Saraç, G., Kaya T. and Geraads, D. 2002. Ancylotherium pentelicum (Perissodactyla, Mammalia) from the Upper Miocene of central and western Turkey.Geobios, Volume 35, Iss 2, Pages 241-251



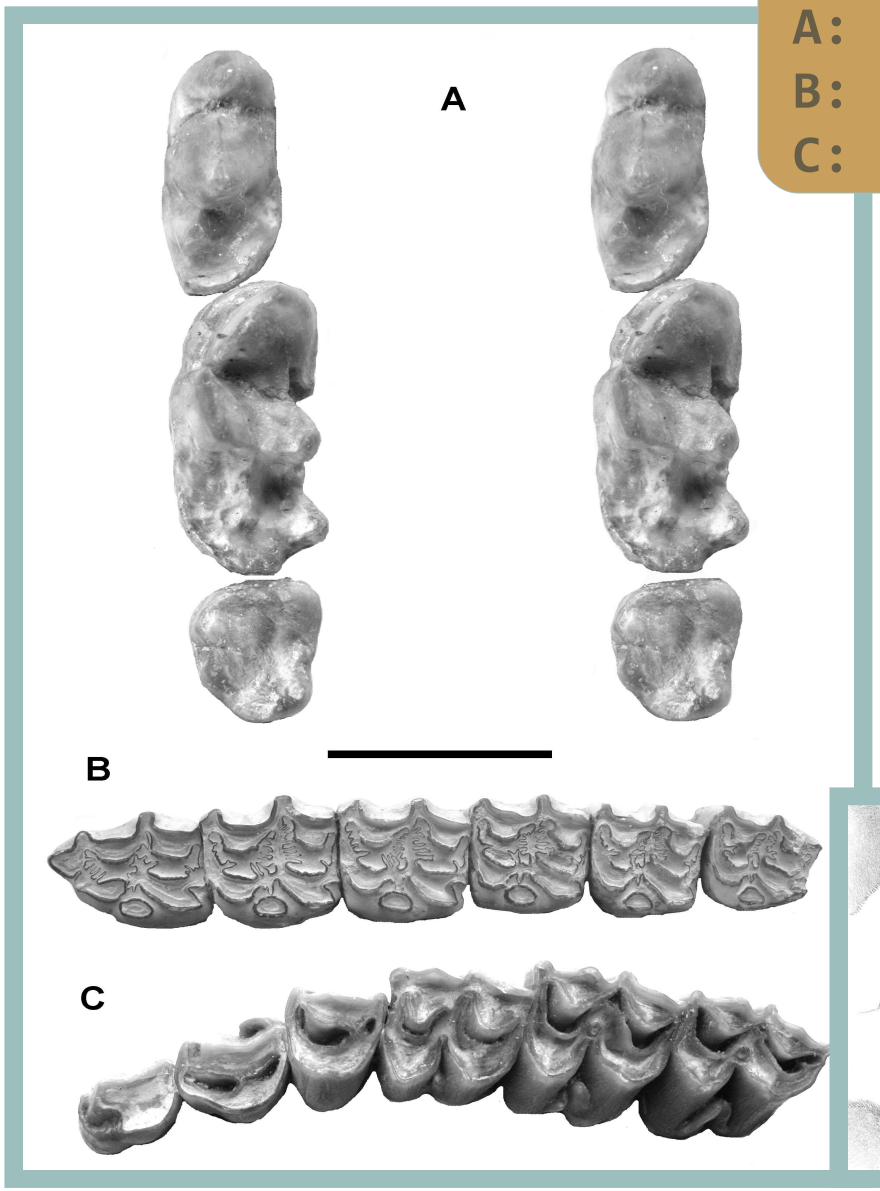
Reconstructed life appearance of the Miocene chalicotherids Chalicotherium grande and Ancylotherium pentelicum

A-B: Promeles smyrnensis n. sp.
C-G: Protictitherium aegaeum n. sp.



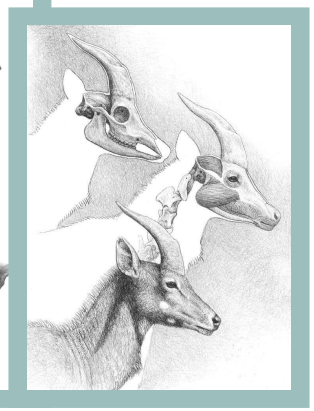
İzmir-Karaburun-Eşendere
Geç Miyosen (MN12)*

* Saraç, Kaya, T.; Geraads, D.; Tuna, V. 2005. A new Late Miocene mammalian fauna in the Karaburun Peninsula (W Turkey) Neues Jahrbuch Fur Geologie Und Palaontologie-Abhandlungen 236: 321-349



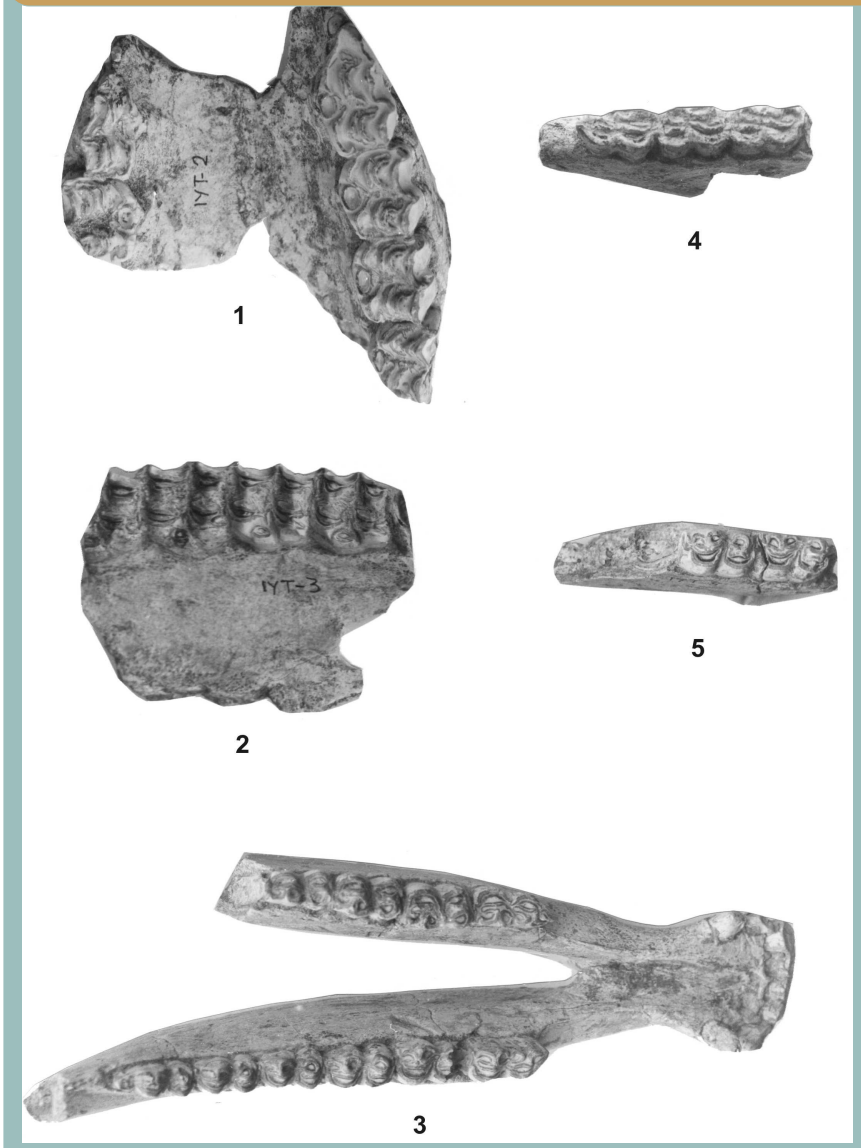
A: Protictitherium aegaeum n. sp.
B: Cromohipparion cf. meditarreneum
C: Tragoportax sp.

İzmir-Karaburun-Eşendere
Late Miocene (MN12)*



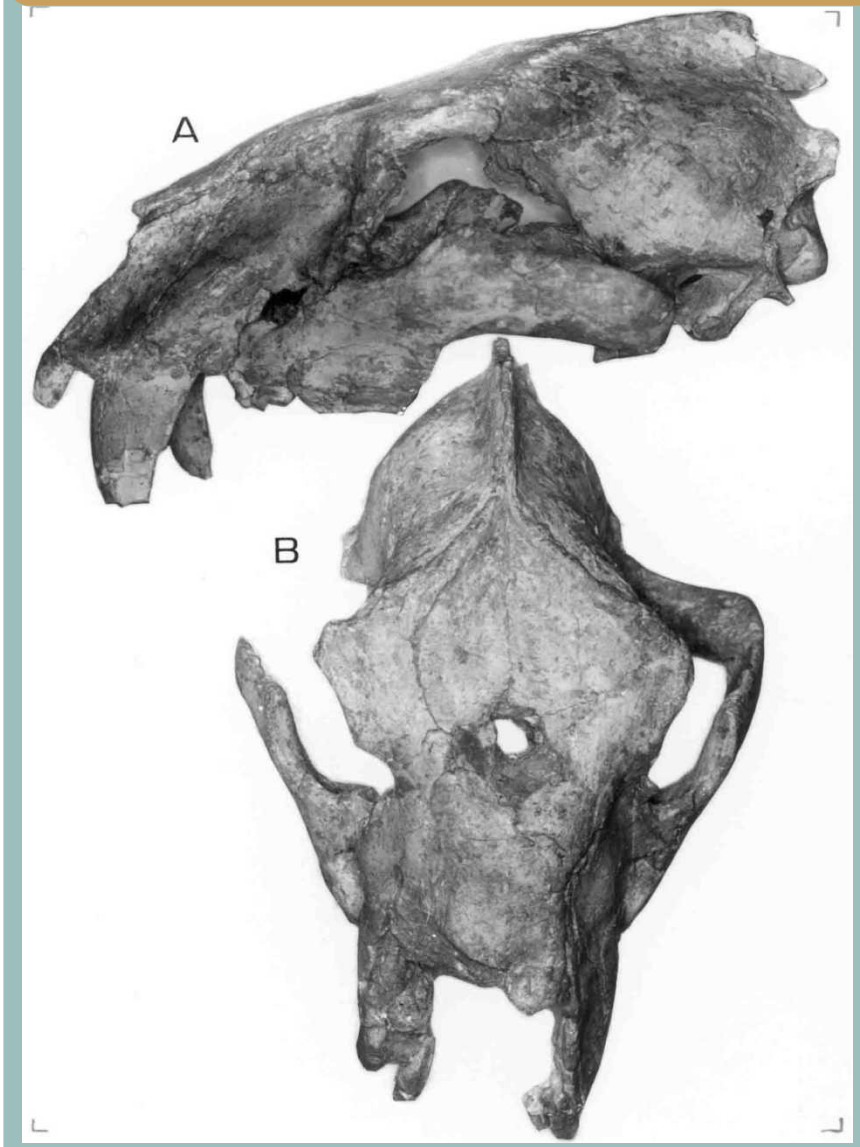
* Saraç, Kaya, T.; Geraads, D.; Tuna, V. 2005. A new Late Miocene mammalian fauna in the Karaburun Peninsula (W Turkey) Neues Jahrbuch Fur Geologie Und Palaontologie-

1-5: Hipparion sp.

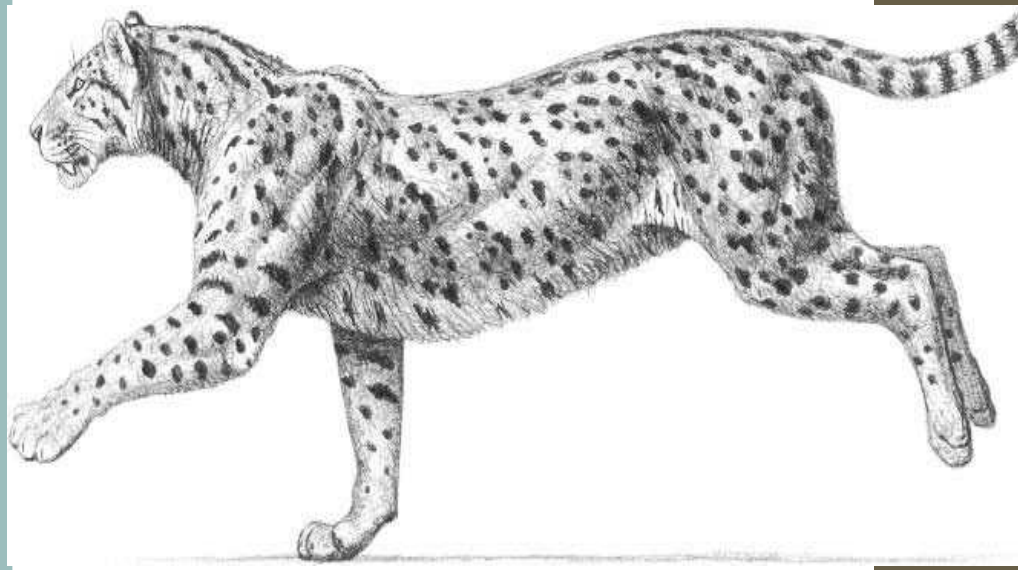


Isparta-Yalvaç-Tokmacık
Geç Miyosen (MN12)

Machairodus giganteus

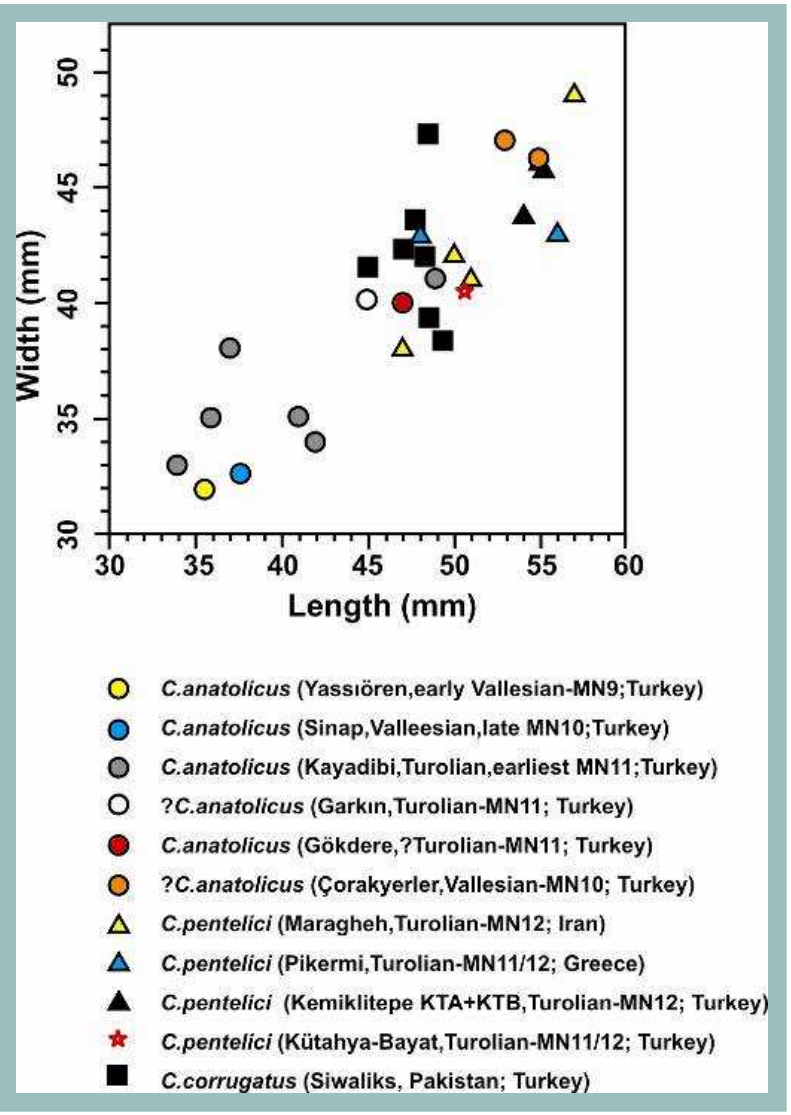


Uşak-Eşme-Kemiklitepe
Late Miyosen (MN12)*

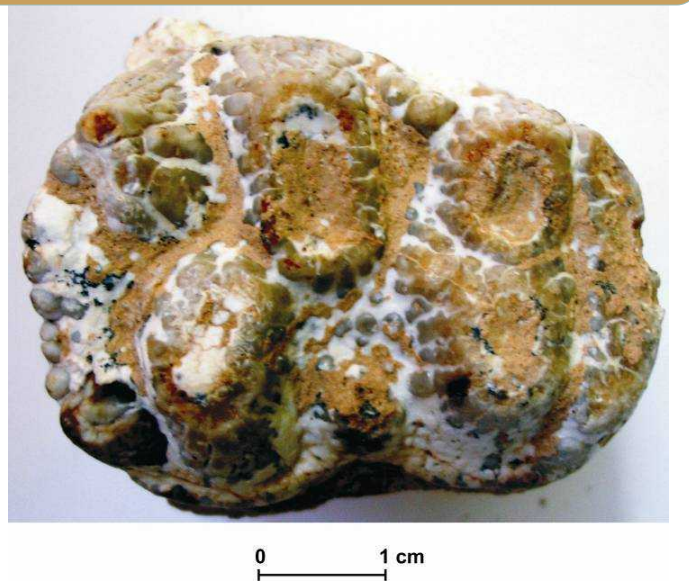


Tetralophodon

Tarsus-Mersin
Geç Miyosen (MN12)



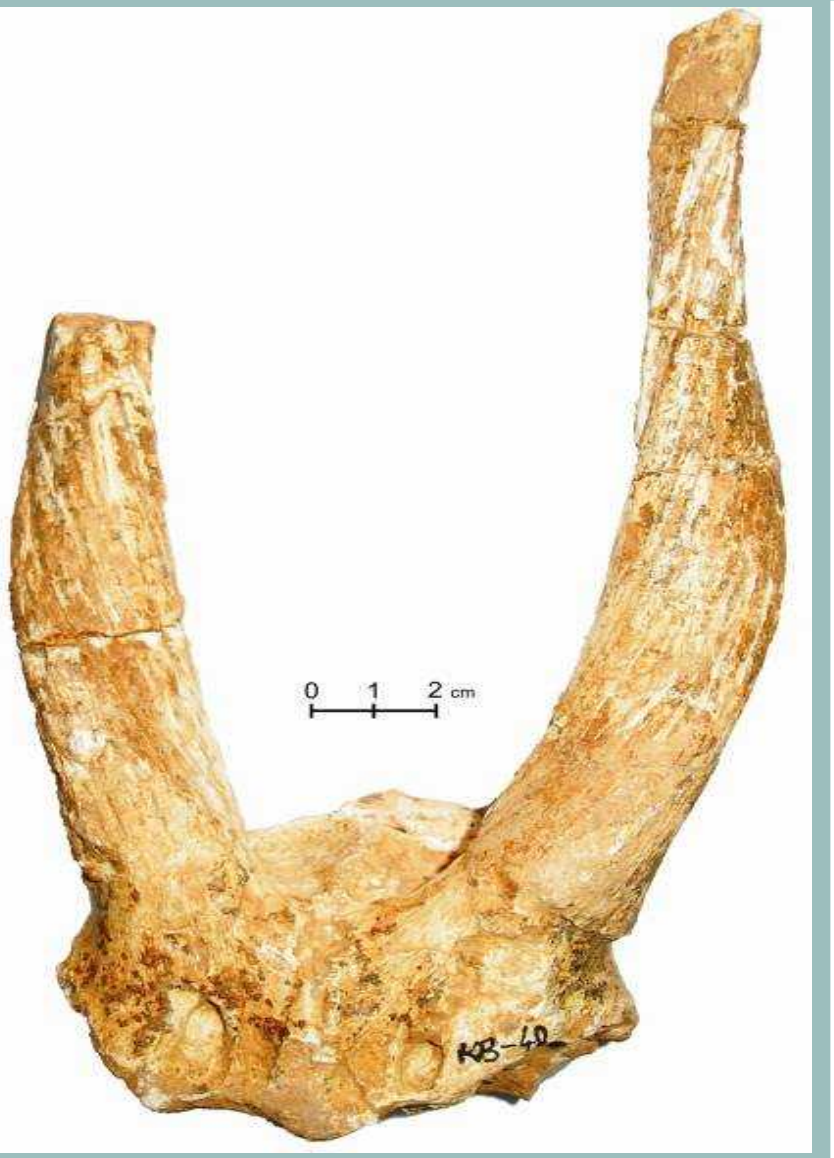
Choerolophodon pentelici



Kütahya-Bayat
Geç Miyosen (MN12)*

* Kaya, T., MAYDA, S. & SARAÇ, G., 2005. New Late Miocene mammalian fauna from Bayat (Kütahya, western Turkey). International Earth Sciences Colloquium on the Aegean regions, 4-7 October 2005.62 p.

Palaeoreas elegans



Kütahya-Bayat
Late Miyosen (MN12)*

* Kaya, T., MAYDA, S. & SARAÇ, G., 2005. New Late Miocene mammalian fauna from Bayat (Kütahya, western Turkey). International Earth Sciences Colloquium on the Aegean regions, 4-7 October 2005.62 p.

PLIOCENE & PLEISTOCENE

Turkey at the crossroads of the Middle East (a natural extension of the Rift Valley in East Africa), Asia and Europe, has been a migration route for humans and animals during Plio-Pleistocene. Anatolia has a rich potential in Neogene paleontology because it offers exceptional conditions of preservation of numerous terrestrial faunas. However, the Plio-Pleistocene deposits of the region and the fossil wildlife they contain are poorly studied

Several issues are pending for interpreting t
study on the evolution of the different
scientific community to benefit from a su
alike faunas in this region

The main Plio-Pleistocene localities

Afyon-Dina

Eskişehir-Ba

Manisa-Dev

Kayseri-İğde

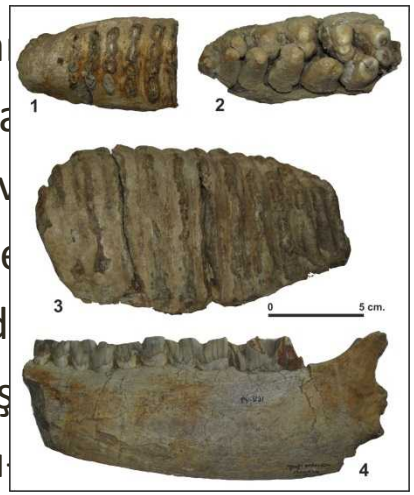
Bolu-Gered

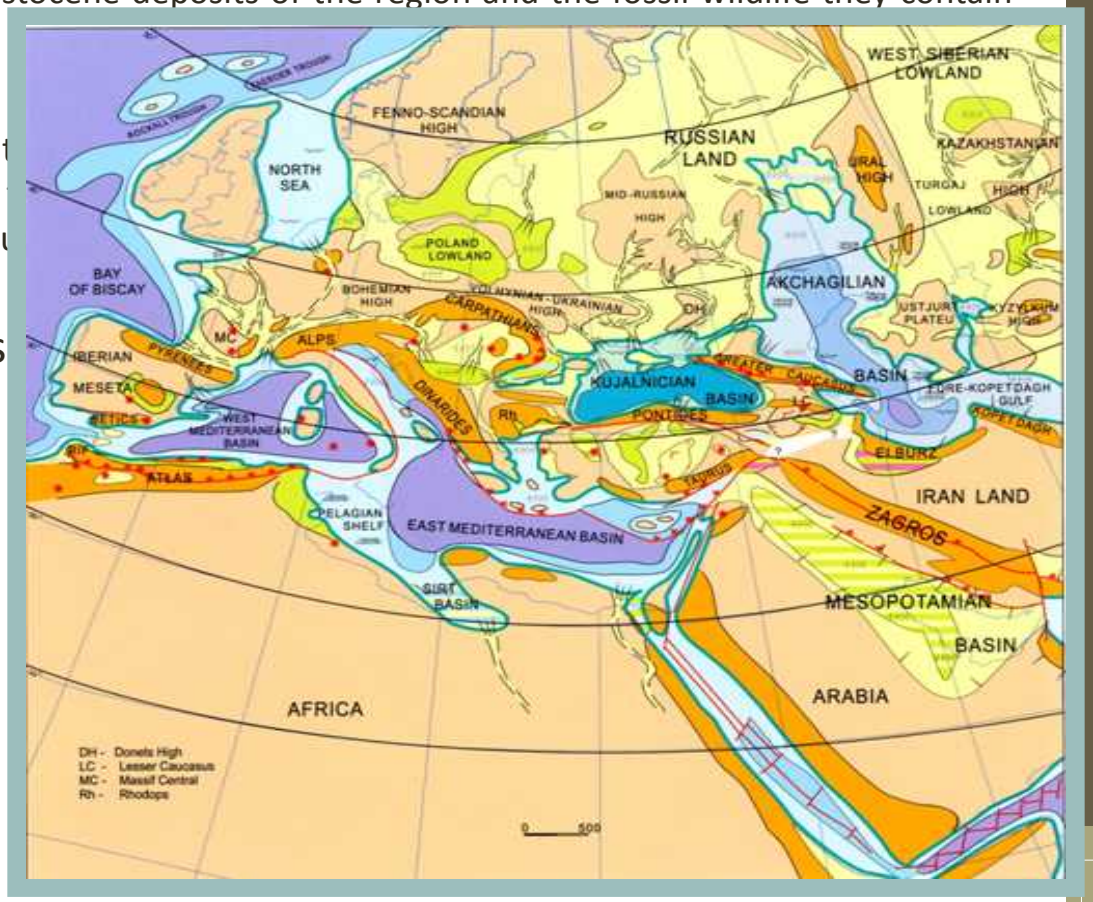
Amasya-Taş

Kastamonu-

Samsun-Hamamayağı,

Muş-Çatakli & Ankara-Çalta





Common taxa: *Equus, Stephanorhinus, Archidiskodon, Anancus* & *Leptobos, Mimomys, Sciurus, Tibericola, Pliomys, Cricetus* (Sickenberg et al., 1975; Şen & Heinz, 1977, Sümengen et al., 1990; Saraç 2003; Ünay ve diğ., 2003; Alçiçek et al., 2012)

Very limited numbers of research results have yet been reached regarding the chronostratigraphy and biostratigraphy of Plio-Pleistocene deposits from Anatolian Neogene-Quaternary Basins and the faunas regarding these studies are located mainly between Western and Northern Anatolian graben systems.

For the first time, Turkish and Russian mammalian paleontologist competent to carry out multi-disciplinary scientific program that aims to define precisely on a time scale paleontological framework and its variations in which the large mammal faunas evolved during Plio-Pleistocene.
Russian-Turkish research team has already started to provide the first systematic definitions of Pliocene and Pleistocene mammal faunas of both sides of Black Sea region as well as Western and Central Anatolia, essential for future studies and will, with certainty, contribute to a better knowledge of dispersion and migration patterns between both regions.