Ciências da Terra (UNL)	Lisboa	Nº 14	pp. 343-348 3 Tab.	2000

Miocene mammals from Lisbon and geologic age
A showcase for marine-continental correlations

Miguel Telles Antunes

Academia das Ciências de Lisboa.

Centro de Estudos Geológicos, Faculdade de Ciências e Tecnologia da UNL, Quinta da Torre 2825-114 Caparica, Portugal.
Tel. (351) 21 294 85 73. Fax: (351) 21 294 85 56. mta@mail.fct.unl.pt

The Lower Tagus basin in Lisbon and Setúbal Peninsula offers excellent conditions for marine-continental correlations, especially for Lower and Middle Miocene. A research Program was long (1960) conceived by us and is being carried on since then. Among its main goals, it deals with Stratigraphy, Palaeontology (and Palaeoecology and Palaeoclimatology), accurate dating (planktic foraminifera, K-Ar, Sr isotopes), other isotope data (O, C) and related tectonic events.

A huge volume of data has been obtained, much improving the already significant earlier status of knowledge. The time seems adequate for trying a global (and much more accurate) synthesis.

The following items will be presented:

- a corrected list of Lower and early Middle Miocene (mostly non marine) mammals, completed and thoroughly revised since earlier attempts (Antunes, 1984; Antunes *in* Antunes *et al.*, 1996).
- an updated model of the Lower Tagus Basin at its distal part (Lisbon & Setúbal Peninsula); the levels that yielded non marine mammals are shown in their accurate frame of marine units and age.
- an overview of environmental evolution, especially on temperature and moisture shifts.

The list of medium to large-sized mammals has been made possible owing to contributions by (among others) Léonard Ginsburg (Paris), Maria Teresa Alberdi & Jorge Morales (Madrid) and the author; for small mammals, by Pierre Mein (Lyon).

The geologic setting is mostly due in its present form to João Pais & Paulo Legoinha (Faculdade de Ciências e Tecnologia, UNL) with author's help. Most general data on vertebrate fauna (including fishes, reptiles and mammals) have been provided by M.T. Antunes.

Table 1

Lower and early Middle Miocene mammals from Lisboa

The ruminants are referred according to Antunes *et al.* (1994). Large to medium-sized mammals have been revised by L. Ginsburg (Paris) and the author. The small mammals were revised by P. Mein (Lyon).
Main localities: H. Tripas = Horta das Tripas; U.Cat. = Universidade Católica; Av. Urug. = Avenida do Uruguai; Qt. Narig. = Quinta do Narigão; Cr. Rei = Cristo Rei; Qt. Pomb/Pedreiras = Quinta do Pombeiro / Quinta das Pedreiras.

Stages	Aquitanian	Burdigalian		Langhian				
Upper boundary isotopic age of the DS		20Ma	17.8Ma	16.4Ma	15.3Ma			
Mammal zones	MN2b	MN3	MN3/4	MN4	MN5			
Iberian zones	Z (lower)	Z (upper)	A/B	C	Db	Dc	D (c?)	Dd/E
Main localities	Km 10	.Tripas/U.Cat/Av. Uru	Qt. Narig./Cr. Re	Qt.Pomb./Pedreira	Chelas 1	Chelas 2	Quintanelas	Amor
Depositional sequences (DS)		A2	B1	B2	L1			
CREODONTA								
Hyainailurus sulzeri					•			
CARNIVORA								
Amphicyon olisiponensis			•					
Amphicyon giganteus				•	•			
Amphicyon sp.				•	•			
Hemicyon cf. *stehlini*			•					
Hemicyon stehlini				•				
Hemicyon sansaniensis parvus					•			
Plithocyon antunesi			•		•			
Ischyrictis cf. *bezianensis*				•	•			
Martes cf. *munki*				•				
Mustelidae ind.				•				•
Viverra (Viverrictis) modica aff. *vetusta*				•	•			
Pseudaelurus transitorius		•						
Pseudaelurus turnauensis			•	•	•			
Pseudaelurus lorteti				•	•			
Pseudaelurus romieviensis					•			
ARTIODACTYLA								
Brachyodus intermedius		•						
Brachyodus onoideus			•					
Aureliachoerus aurelianensis		•						
Bunolistriodon lockarti				•	•			
Hyotherium soemmeringi					•			•
Taucanamo primum				•	•			
Cainotherium sp.	•	•						
Cainotherium miocaenicum			•	•	•	•		•
Dorcatherium crassum				•	•		•	
Andegameryx andegaviensis	•							
Amphitragulus aurelianensis				•	•			
Procervulus dichotomus				•		•	•	
? *Lagomeryx ruetimeyeri*				•				
Lagomeryx minimus				•			•	•
Cervidae ind. 1								•
Cervidae ind. 2								•
Palaeomeryx kaupi			•	•	•		•	•
Eotragus artenensis				•				
PERISSODACTYLA								
Anchitherium sp.			•					
Anchitherium cf. *ezquerrae*					•			
Protaceratherium minimum		•						
Diaceratherium cf. *aurelianensis*		•						
Plesiaceratherium platyodon			•					
Plesiaceratherium lumiarense				•	•			
Prosantorhinus cf. *germanicus*			•	•	•			
Lartetotherium sansanensis					•			
Hispanotherium matritensis					•		•	•
Iberotherium rexmanueli				•				
Iberotherium rexmanueli zbyszewski					•			
Schizotheriinae ind.					•			
PROBOSCIDEA								
Gomphotherium angustidens			•	•	•		•	•
Zygolophodon turicensis			•	•	•			
Prodeinotherium cuvieri				•	•		•	
SIRENIA								
Cf. *Halitherium* sp.		•						
Metaxytherium medium			•(?)	•	•			

Table 1

Lower and early Middle Miocene mammals from Lisboa (cont.)

Stages	Aquitanian	Burdigalian		Langhian				
Upper boundary isotopic age of the DS		20Ma	17.8Ma	16.4Ma	15.3Ma			
Mammal zones	MN2b	MN3	MN3/4	MN4	MN5			
Iberian zones	Z (lower)	Z (upper)	A/B	C	Db	Dc	D (c?)	Dd/E
Main localities	Km 10	.Tripas/U.Cat/Av. Uru	Qt. Narig./Cr. Re	Qt.Pomb./Pedreira	Chelas 1	Chelas 2	Quintanelas	Amor
Depositional sequences (DS)		A2	B1	B2	L1			
INSECTIVORA								
Galerix symeonidisi				•				
Galerix cf. *exilis*								•
Galerix sp.	•				•	•		
Crocidosorex antiquus		•						
Miosorex aff. *grivensis*								•
Soricidae ind.	•							
Amphechinus sp.		•						
Paratalpa sp.		•						
Dimylidae ind.		•						
LAGOMORPHA								
Lagopsis spiracensis	•							
Lagopsis cadeoti		•						
Lagopsis peñai			•	•	•	•		
Lagopsis cf. *peñai*								•
Prolagus vasconiensis		•						
Prolagus oeningensis								•
RODENTIA								
Heteroxerus paulhiacensis	•							
Heteroxerus cf. *paulhiacensis*		•						
Heteroxerus rubricati (archaic)		•						
Heteroxerus rubricati			•	•	•	•		
Atlantoxerus blacki				•				
Palaeosciurus fissurae	•							
Blackia miocaenica	•							
Sciuridae ind.	•							
Myoglis sp.		•						
Glirudinus modestus	•	•						
Microdyromys legidensis		•						
Microdyromys koenigswaldi					•	•		•
Peridyromys murinus	•	•	•					
Pseudodryomys ibericus	•	•		•	•			
Pseudodryomys robustus			•					
Praearmantomys ginsburgi				•				
Armantomys sp. (*parsani* ?)		•						
Armantomys aragonensis					•			
Prodryomys brailloni	•							
Ligerimys antiquus	•	•	•					
Melissiodon dominans	•							
Melissiodon sp.						•		
Eucricetodon infralactorensis		•						
Megacricetodon collongensis				•	•	•		•
Democricetodon sp. (*hispanicus* ?)				•				
Democricetodon sp. nov.					•			
Pseudofahlbuschia jordensi						•		
? *Cricetodon* sp.								•
CETACEA Odontoceti								
Delphinidae ind.			•					

Table 2

Model of Lower Tagus basin (distal part), Lisboa & Setúbal Peninsula area (Antunes *et al.*, 2000).

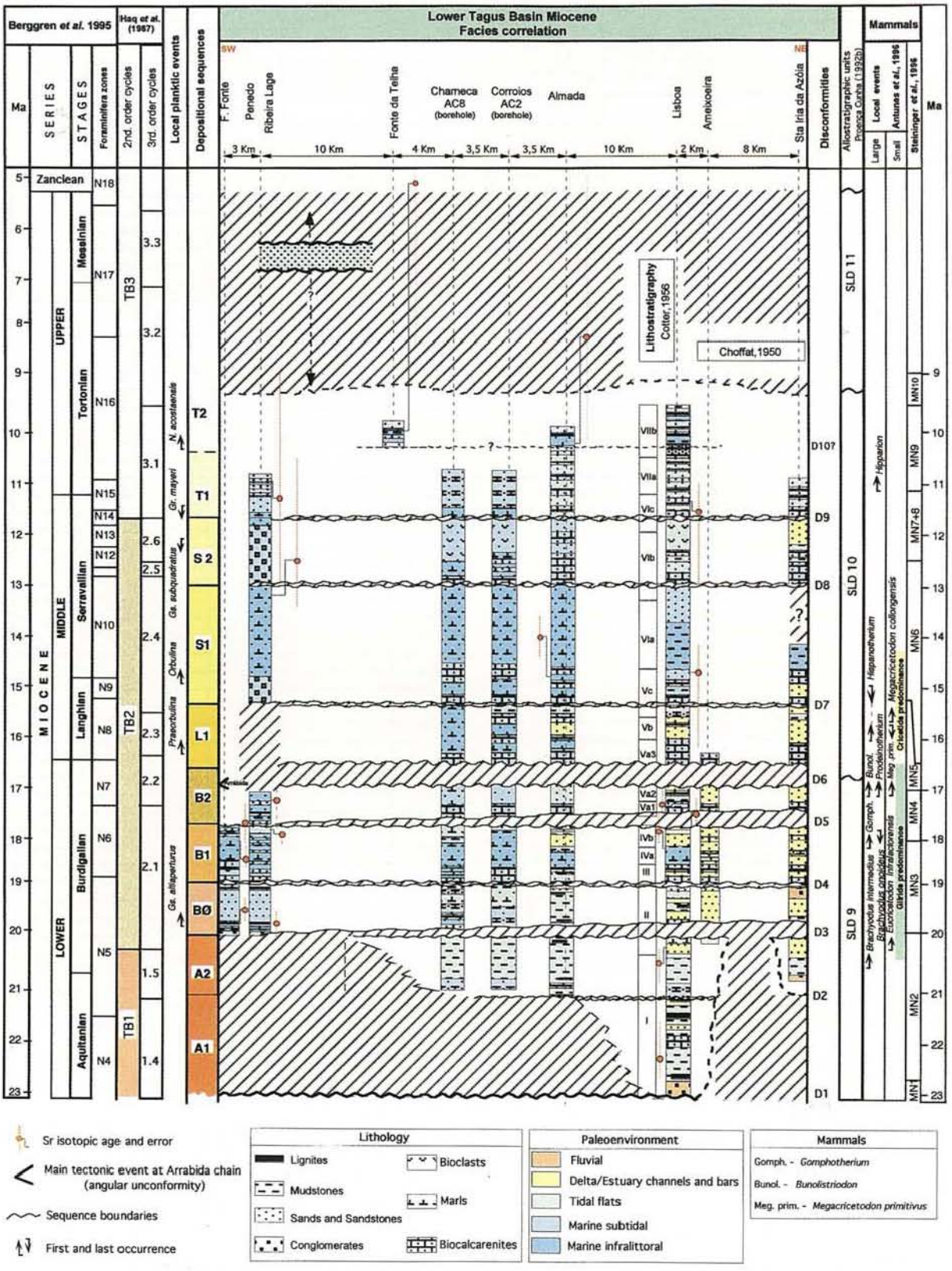
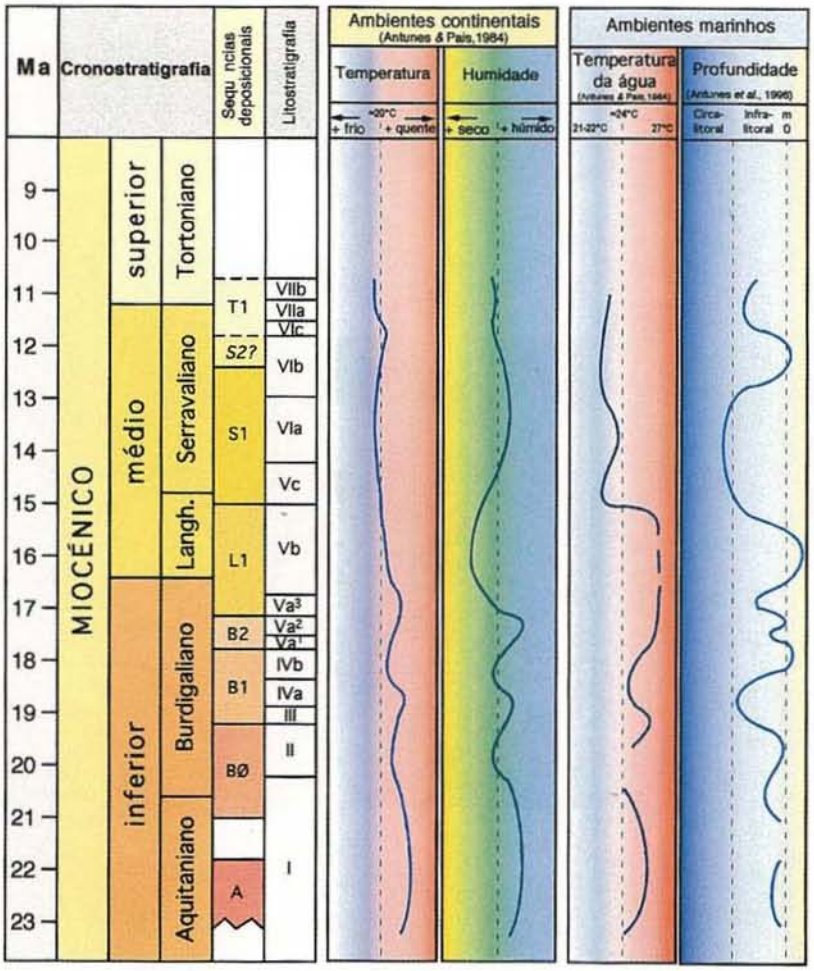


Table 3

Temperature and moisture evolution during Miocene (Pais, 1999).



REFERENCES

Antunes, M.T. (1984) - Essai de synthèse sur les Mammifères du Miocène du Portugal. *Volume d'hommage au géologue G. Zbyszewski,* Éd. Recherche sur les Civilisations, Paris, p. 301-323.

Antunes, M.T.; Azanza, B.; Morales, J. & Soria, D. (1994) - Los Ruminantes (Artiodactyla, Mammalia) del Mioceno inferior del área de Lisboa (Cuenca del Tajo, Portugal). *Rev. Española de Paleontología*, 9(1): 51-71.

Antunes, M. T. & Ginsburg, L. (2000) - Les Perissodactyles (Mammalia) du Miocène de Lisbonne. *1° Congresso sobre o Cenozóico de Portugal,* Monte de Caparica: 281-286.

Antunes, M. T. & Ginsburg, L. (2000) -Présence du Créodonte *Hyainailouros sulzeri* dans le Miocène du bassin du Bas Tage (Lisbonne, Portugal). *1° Congresso sobre o Cenozóico de Portugal,* Monte de Caparica: 287-290.

Antunes, M.T.; Legoinha, P.; Nascimento, A. & Pais, J. (1996) - The Evolution of the Lower Tagus basin (Lisbon and Setúbal Peninsula, Portugal) from Lower to earlier Middle Miocene. *Géologie de la France*, 4: 1-16. Ed. BRGM, Orléans.

Antunes, M. T.; Legoinha, P.; Cunha, P. & J. Pais (2000) - Estratigrafia de alta resolução e correlação de fácies do Aquitaniano ao Tortoniano inferior de Lisboa e da Península de Setúbal (Bacia do Baixo Tejo, Portugal). *1° Congresso sobre o Cenozóico de Portugal*, Monte de Caparica: 159 - 166.

Pais, J. (1999) - História geológica da Península de Setúbal nos últimos 20 milhões de anos. Guia de visita de campo integrada Programa Ciência Viva, Geologia no Verão. *Centro de Estudos Geológicos,* Monte de Caparica, 21 p.