

EOCENE MAMMALS FROM IBERIAN PENINSULA

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ABSTRACT

A synthesis on the Iberian Peninsula Eocene mammalian record is presented here. Localities range in age from the Lowermost Eocene, MP 7 unit (Dormaal) until the Uppermost Eocene, MP 20 (Saint-Capraise). At present, 73 fossil sites in 12 basins are known. Faunal lists are given for each site.

Key-Words: Mammals, Eocene, Iberian Peninsula

RÉSUMÉ

MAMMIFÈRES DE L'ÉOCÈNE DE LA PÉNINSULE IBÉRIQUE

On présente une synthèse concernant les gisements à mammifères éocènes de la Péninsule Ibérique. Les gisements en question se rangent depuis l'Eocène basal, unité MP 7 (Dormaal) jusqu'à l'Eocène terminal, MP 20 (Saint-Capraise). Jusqu'à présent on connaît 73 sites, correspondant à 12 bassins. Pour chaque localité on présente la correspondante liste faunique actualisée.

Mots-clés: Mammifères, Eocène, Péninsule ibérique

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INTRODUCTION

Mammals are one of the key groups in Paleontology. Their importance is critical for continental Stratigraphy and Paleogeography.

This is especially true for Eocene times and for the Iberian Peninsula. What is now the Iberian Peninsula (well before the accretion that resulted from the Betic collision in the Lower Miocene) was progressively being abandoned by the sea. This regressive process took place by Late Cretaceous and later, in the frame of a generalized post-Cenomanian tendency.

Meanwhile there was the uplift of the Pyrenees and other mountain ranges as the Central Iberian Chain. Increased erosion and transport during and after the Pyrenean paroxysmal phase in the lower part of the Upper Eocene resulted in the infilling of adjoining basins. Hence the importance of the Eocene formations, mainly in the Pyrenean region, elsewhere in Catalonia, in the Duero basin and its more or less related depressions in Portugal-North of the great fractures that limit the Central Chain.

The evolution of the geologic knowledge proceeded in Spain and Portugal. Sometimes there has been good cooperation, but research was often carried on with rather poor reciprocal knowledge. We therefore think a synthesis on the Eocene Iberian mammals is useful.

Pioneer work had been done in Spain, including that by F. Roman, and later by M. Crusafont and J. de Villalta. One of us (M.T.A.) is glad to acknowledge his interest on this field and on eventual developments in Portugal aroused from the *IV Curso Internacional de Paleontología* he attended at Sabadell in 1958.

Iberian faunal peculiarities may be ascribed to different environments and maybe to paleogeography.

Comparative studies on similar faunas from France and from elsewhere (as North Africa) will be even much more needed. Migrations and Paleogeography should be better known.

HISTORY OF THE KNOWLEDGE ABOUT IBERIAN EOCENE MAMMALS

The knowledge on Iberian Eocene mammals progressed a lot in the last decades. However some discoveries have been made in the 19th century.

SPAIN

• DUERO basin (concerned Portuguese basins being related to this large one)

The first reference to Spanish Paleogene vertebrates has been made by Gervais (1859). However the first sure account about vertebrates in the Duero basin (near Sanzoles) pointing out to a paleogene age, is that by Vilanova (1873).

Gil y Maestre (1880) and Puig y Larraz (1883) dealt with the geology of the Tertiary in the Salamanca and Zamora regions. Mammalian bones from Villamayor were reported by Calderon (1902). Sometime later, Miquel (1906) reported on remnants collected at San Morales that A. Gaudry ascribed to *Palaeotherium minus* and *Xiphodon gracile*, among other forms. This confirmed the presence of Paleogene. New fossils were collected at Corrales del Vino (Zamora), summarily referred

to by Hernandez-Pacheco (1915) and described by Roman & Royo y Gomez (1922), the Corrales site being regarded as Lutetian, Middle Eocene in age.

Taking into account previous work, Hernandez-Pacheco (1943) distinguishes Lutetian deposits at Corrales and Ludian ones near Salamanca. In the same region at Cabrerizos, Aldealengua and Aldearrubia, palaeotherids and an hypothetical creodont indicated a Ludian age; the presence of a Palaeotherid at Sanzoles is referred (Crusafont & Truyols 1957).

Still later, there has been an increase of papers on Stratigraphy, Sedimentology and Paleontology, more or less quoting earlier contributions. New discoveries were made. At Babilafuente near Salamanca, two rodents suggest an age close by that of the Robiac site in France (Lopez 1982).

Since 1988, M.A. Cuesta undertook the study of the Eocene mammals from the Duero basin near Salamanca, Zamora and Soria. The Mazaterón site was reported for the first time (Cuesta 1991, 1993). Data on new paleogene mammalian taxa from the Duero basin were presented (Jiménez *et al.* 1989; Peláez-Campomanes *et al.* 1989).

There are further contributions concerning Paleogene sites by Cuesta (1991, 1993, 1994a, 1994b, 1994c, 1996) and by Cuesta *et al.* (1993, 1994); a new locality at Fuentesauco (Zamora) close by the Middle-Upper Eocene limit in age was found.

• OVIEDO basin

The Oviedo basin's continental, Tertiary infillings were recognized by Barrois (1878) on the basis of a freshwater mollusk fauna ascribed to the Upper Eocene. Nevertheless, Mallada (1904) still reported these sediments to the Cretaceous, as it was done in all geologic maps of Spain until that of Asturias by Cueto in 1926 (Truyols & García-Ramos 1991).

The only vertebrate site, Llamaquique, discovered in 1926, clearly demonstrated a Tertiary age (González & Gomez de Llarena 1926). Some remnants were ascribed to *Palaeotherium magnum* by Royo y Gomez (1927), who reported on other Llamaquique fossils (Royo y Gomez 1928).

No further work on mammals was done until 1987; only a chelonian had been described (Bergounioux 1957; Jiménez 1977). Then the study on the Eocene mammals from Llamaquique proceeded again (Casanovas & Santafé 1987, 1989, 1992; Moya-Sola 1992).

• CALATAYUD-TERUEL basin

Sierra Palomera's Paleogene continental formations and their biostratigraphic status within the frame of the eastern parts of the Iberian Cordillera were dealt with by Adrover *et al.* (1983), and Pelaez-Campomanes (unpubl. thesis 1993), who studied late Upper Eocene rodents from Sierra Palomera and Villarrosano 1 and 12.

• UPPER TAJO basin

A breccia with bones was discovered in the Huérmeces area, Guadalajara (communication to the Sociedad Española de Historia Natural presented May 6th, 1931 by Bargalló). After a visit to the site, Royo y Gomez reported it to the Upper Eocene.

The same site was rediscovered in 1957. Its age was then believed to be Upper Tertiary/ "Pontian" (Riba 1957, V INQUA Congress Field Guide).

Vertebrates were collected at Huérmeces del Cerro, including *Palaeotherium crassum* and

Palaeotherium magnum; an upper Ludian age was accepted as possible (Crusafont, Meléndez & Truyols 1960). The same locality was referred again by Antunes (1964); Franzen (1968); Casanovas & Santafé (1987).

• SOUTH-PYRENEAN depression

Western, Central and Eastern basins may be recognized in this depression, the Central or Tremp, Jaca and Pamplona basin being the better known. It may be subdivided into the Ager, Tremp-Graus, Isàvena and Poblade Segur sub-basins.

Mammals and other vertebrates were reported in 1956 (*Boletín A.E.P.V.*, n° 4-5, Sabadell) after specimens from several sites (Crusafont & Rosell 1965). Age was not known. Later on, M. Crusafont and collaborators found other sites. Even if the material was rather poor, it was ascribed to the Upper Cuisian and the Lower Lutetian (Crusafont *et al.* 1968).

The same beds have been referred by several authors, and lately by Checa (1994) after new exploitation and collecting.

The Tremp-Graus sub-basin comprises the Montllobar and Pont de Montanyana areas (Checa 1994). The presence of continental beds was suspected since 1934 (Golpe 1971). A mammal was described (Crusafont & Villalta 1954). Since then, continental Eocene was found at several points at the Sierra de Montllobar. The lower beds yielded a mammal at Barranc de Forals (Crusafont 1956). (For more details see Crusafont, Villalta & Truyols 1956). Collecting was resumed in 1990, and up-to-date faunal lists concerning this Area and other Pre-Pyrenean sub-basins were given (Checa 1994).

Continental Eocene from Pont de Montanyana was exploited following geologic mapping by Malec (from Mainz), in which the so-far known sites are shown (Crusafont 1958; Golpe 1971; Crusafont & Casanovas 1973; Crusafont & Golpe 1973, 1974). Field work continued in 1990.

Collecting in the Isàvena sub-basin was carried on the Capella lignite mines (Golpe 1971). A Lophiodontid mandibular fragment was reported (Crusafont 1958). This and another fossil sent Crusafont by Meléndez induced the beginning of the study of the Capella mine. Further sites were found in the same sub-basin and reported since 1959 (Checa 1994).

The earliest site discovered in the La Poblade Segur sub-basin (Collegats Formation) is Sossís. This and Roc de Santa are the richest continental

Eocene localities in the Pre-Pyrenean depression in Catalonia. Following a visit to the mine, the Sossís site was referred to (Bataller 1942). Sossís lignite was once regarded as Cretaceous, and later as Oligocene. The fossils obtained by Bataller suggested him an Upper Eocene age, although this has only been corroborated through the identification (Villalta & Crusafont 1944) of *Palaeotherium magnum*.

From the sixties on, research was extended to marls intercalated with lignite beds. Marls yielded mammal remnants (Checa & Casanovas 1989-90).

Washing and sieving techniques were introduced in Spain by L. Thaler and J.-L. Hartenberger (Montpellier). A large number of micromammals (rodents, insectivores, primates, etc.) was collected. Small mammals contributed to ascribe the Sossís lignites to the lower Ludian, Fons 4 zone. Sossís fossils were described in some doctoral theses, mostly by french authors. Mammalian remnants have been revised by Casanovas, Checa & Santafé (paper on *Perissodactyla* in press). Other articles on rodents, insectivores, primates, etc. are also in press.

Another site in the same area in the La Pobla de Segur sub-basin is Roc de Santa, discovered (1970) by staff of the Instituto de Paleontología de Sabadell and excavated until 1974. Age is the same as for Sossís. Dental material was studied by Casanovas-Cladellas (Barcelona Univ. thesis 1975); post-cranial bones were dealt with by the same author in collaboration with Santafé & Checa (several papers). Still later, washing and sieving allowed the recovery of large numbers of micromammal remnants.

Eocene mammals have been found in the Eastern basin by Busquets *et al.* (1992). Busquets has shown the sites to the staff of the Instituto de Paleontología de Sabadell; large amounts of specimens were collected. Checa-Soler (Barcelona Univ. thesis 1994) dealt with the *Perissodactyla*. Additional material is under study.

- EBRO basin

The Eastern or Catalánides sector was prospected by F. Colombo. The collected material is under study by researchers of the Instituto de Paleontología M. Crusafont (several papers; Checa, Thesis 1994).

- CENTRAL CATALONIAN basin

Generally poor Eocene sites with mammalian

remnants are known since long ago. The site at Sant Cugat de Gavadons, Moyà sub-basin, was exploited by the Instituto de Paleontología M. Crusafont staff during the sixties and seventies; it yielded an interesting assemblage of Upper Eocene macro- and micromammals.

PORTUGAL

- MONDEGO basin

- LOUSÃ basin

- LESSER DEPRESSIONS IN THE BEIRA ALTA PENEPLAIN

The first studies where Paleogene units are referred were focused on the Lower Tagus basin, where no vertebrate fossils are known; the earliest seems to be a memoir by Baron Wilhelm-Ludwig von Eschwege (Eschwege 1831), where he refers the "*Conglomerados, que se achão no Valle de Bemfica e Porcalhota*" (p. 262 and geologic section; this corresponds to the unit subsequently named *Complexo de Bemfica*). Near Lisbon, the *Complexo de Bemfica* is comprised between the underlying *Complexo vulcânico de Lisboa-Mafra* and the marine, Lowermost Miocene.

Under the influence of Paul Choffat (Choffat posthumous paper 1950; and earlier contributions), the post-Cenomanian *Complexo vulcânico*, and the *Complexo de Bemfica* were regarded respectively as Eocene and Oligocene in age. This largely conjectural opinion was generally accepted, and an Oligocene age was assigned to other continental units elsewhere in Portugal supposedly correlative to the *Complexo de Bemfica*.

Meanwhile, Rb-Sr dating demonstrated a Late Cretaceous age for the *Complexo vulcânico*, while stratigraphic correlation (mainly based on feldspar-rich sands that probably have been distally deposited after the paroxysmal Pyrenean event) suggested instead an Eocene age for the lower subunits of the *Complexo de Bemfica* (Antunes 1979).

Actual data on Eocene vertebrates concern sites North of the great fractures (i.e. the Nazaré accident) that limit the Central Chain, where several Eocene units and sites are known (Ginsburg & Zbyszewski 1965; Antunes 1975, 1979). No Oligocene ones were recognized.

The first fossil mammals were collected at Côja. However their true nature and age were not recognized until later, when the presence of an Upper

Eocene paleotherid was shown for the first time in Portugal (Antunes 1964). Other papers followed (Antunes 1967, 1986b, 1992; Antunes & De Broin 1977).

Later Middle and early Upper Eocene discoveries were made at the coast North of Nazaré at Vale Furado and Feligueira Grande (Antunes 1986a, 1995). A major discovery of an earliest Eocene (or

late Paleocene?) vertebrate fauna at Silveirinha, Baixo Mondego area, fully justified the launching (by M.T. Antunes) of a Research Program which is still in progress (Antunes 1981; Antunes & Russell 1981; Antunes, Estravís & Russell 1987; Estravís 1990, 1992, 1994; Estravís & Russell 1989, 1992a, 1992b).

BASINS, SITES AND FAUNAL LISTS

In our present state of knowledge, the Iberian basins and sites that yielded Eocene mammals are as follows, from West to East (Fig. 1).

[REMARKS: Lists are presented as given by authors, no revision or discussion was attempted; CAPITAL, countries, basins and subbasins; sites are in **bold**; approximate age is given, as well as MP, Paleogene Mammal-units.]

Overall similarities seem stronger than differences. More detailed comparative studies involving Spanish collections will be most useful. One will then be in a better position to ascertain how real are some of the Iberian faunal peculiarities. After all, the Pyrenees may not have been effective enough as a barrier as far as mammal migrations are concerned.

PORTUGAL

As for portuguese material, comparisons have most often been made with French collections.

MONDEGO basin

Lowermost Eocene, MP 7

– **Silveirinha** (after C. Estravís 1992, unpubl.)

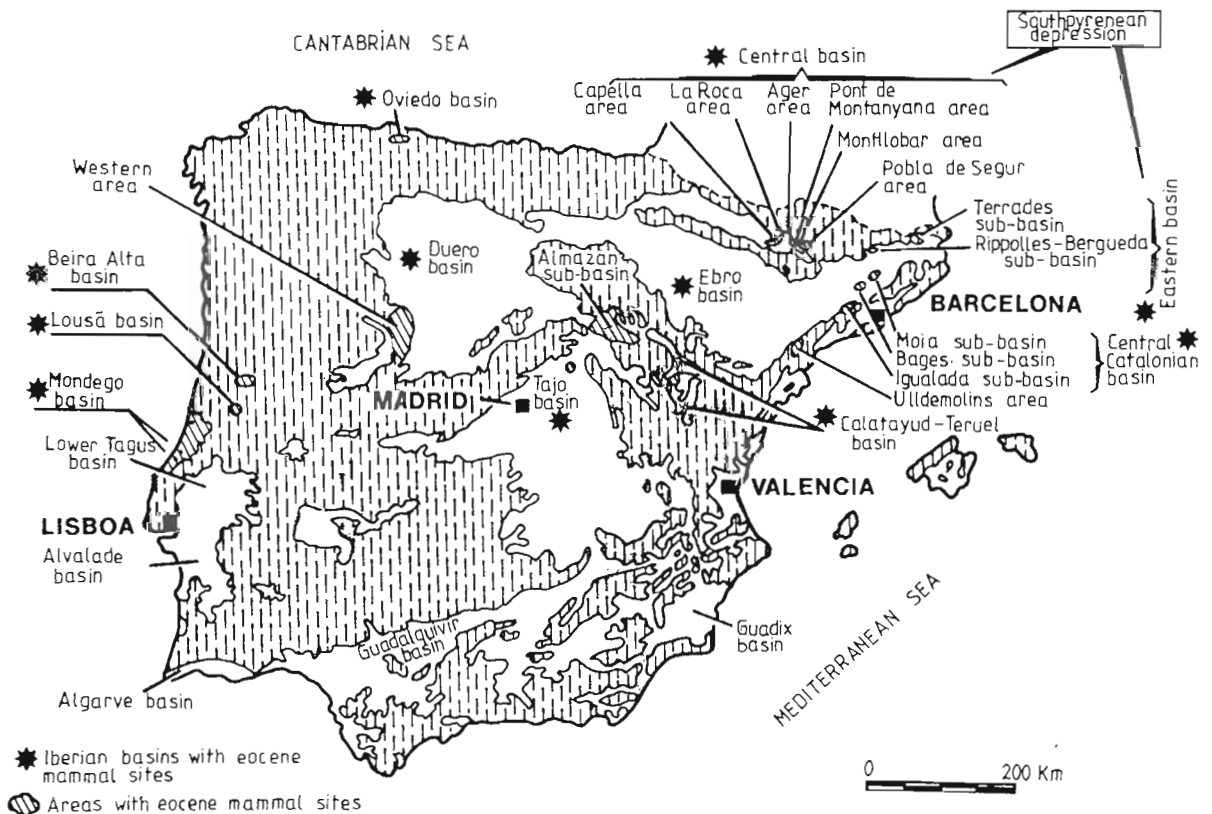


Figure 1.— Iberian Peninsula: the main Tertiary basins and Eocene mammal sites.

thesis prepared under the direction of M.T. Antunes & D.E. Russell, and several papers by these authors):

Peratherium cf. *constans*
Apatemys sp. I
 cf. *Apatemys* sp. II
Heterohyus sp. I
Heterohyus sp. II
Russellmys denisae
Leptacodon nascimentoi
 cf. *Leptacodon* sp.
 Nyctitheriidae undet. gen. and sp.
 ?Nyctitheriidae or ?Dormaaliidae undet. gen. and sp.
 ?*Talpavus* sp.
Didelphodus sp.
Arcius zbyziewskii
Eurodon silveirinhensis
Donrussellia lusitanica
 cf. *Cantius* sp. and/or cf. *Donrussellia* sp.
 Creodonta, undet. fam., gen. and sp.
Miacis cf. *latouri*
 cf. *Miacis* sp.
 cf. *Viverravus* sp.
 Miacidae, undet. gen. and sp.
Microparamys paisi
Microparamys cf. *nanus*
Meldimys cardosoi
Paschatherium marianae
Microhyus reisi
Diacodexis antunesi
Hyracotherium cf. *vulpiceps*
 cf. *Lophiaspis maurettei*
Illerdoryctes cf. *sigei*
 Undet. order, fam., gen. and sp.

Middle Eoc., MP 13 or 14

– **Vale Furado:**

Paralophiodon cf. *leptorhynchum*.

Lower Upper Eoc., MP 17

– **Feligueira Grande:**

Paranchilophus lusitanicus.

LOUSÃ basin

Upper Eoc., MP 19

– **Côja:**

Peratherium cuvieri
Palaeotherium cf. *crassum*
Palaeotherium magnum
Anoplotherium cf. *commune*
Diplobune secundaria

LESSER DEPRESSIONS IN THE
 BEIRA ALTA PENEPLAIN

These are much eroded, vestigial remnants of deposits related to the Duero basin.

Upper Eoc., ?MP 19

– **Naia:**

cf. *Palaeotherium* sp.

SPAIN

DUERO basin

Middle Eoc., MP 13 to 16

– **Casaseca de Campeán, MP 13-14:**

Pachynolophus sp.
Plagiolophus casasecaensis
 undet. Palaeotheriidae
Lophiodon cf. *tapirotherium*
Paralophiodon aff. *isselense*
 undet. Lophiodontidae
 undet. Artiodactyla.

– **Corrales, MP 13-14:**

undet. Pachynolophinae
 undet. Pachynolophidae
Paralophiodon aff. *isselense*
 ?Lophiodontidae.

– **El Viso-Sanzoles, MP 14:**

Zamoranus extraneus
Pachynolophus sp.
Plagiolophus sp.

– **Jambrina, MP 13-14:**

undet. Nyctitheriidae
 undet. Lophiodontidae
 undet. Pachynolophinae.

– **Santa Clara, MP 13-14:**

Peratherium matronense
 undet. cf. Palaeoryctidae
 undet. cf. Anagalida
Anchomomys cf. *stehlini*
Zamoranus extraneus
Microparamys sp.
Plagiolophus cf. *casasecaensis*
 undet. cf. Dichobunidae.

– **Caenes, MP 15-16:**

undet. Creodonta
Microadapis sp.
Paranchilophus sp.

- Plagiolophus mazateronensis*
Franzenium durense
 undet. Lophiodontidae
 undet. Artiodactyla.
- **San Morales**, MP 15-16:
Lophiodon sanmoralense
 cf. *Anchilophus* sp.
Plagiolophus sp.
 undet. Palaeotheriidae.
- **Babilafuente**, MP 16:
Remys aff. *minimum*.
- **Mazaterón**, MP 15-16:
Proviverra sp.
 undet. Anchomomyini
 undet. Adapidae
Pseudoloris sp.
Sciuroides cf. *siderolithicus*
Pseudoltinomys crebrum
Pairomys ibericus
Paranchilophus remyi
Plagiolophus mazateronensis
Plagiolophus sp.
Leptolophus sp.
Palaeotherium giganteum
Cantabrotherium casanovasae
Franzenium durense
Lophiodon sp.
 cf. *Dacrytherium* sp.
 cf. *Leptotheridium* sp.
 cf. *Dichodon* sp.
 Anoplotheriinae sp.
- **Miñana**, MP 15:
Amphiperatherium cf. *minimum*
Saturninia cf. *mamertensis*
Sciuroides cf. *siderolithicus*
Pseudoltinomys crebrum
Pairomys ibericus
Theridomys euzetensis.
- **Fuentesauco**, MP 15-16:
Franzenium durense.
- **Deza I**, MP 15-16:
Plagiolophus sp.
- Upper Eoc., MP 17
- **Deza II**:
Theridomys euzetensis
Glamys priscus.
- Upper Eoc. or Oligocene?, MP ?
- **Molino del Pico**:
 undet. Palaeotheriida
Plagiolophus sp.
- OVIEDO basin
- Middle or Upper Eoc., MP 16 or 17
- **Llamaquique**:
Paranchilophus remyi
Palaeotherium llamaquiquense
Cantabrotherium truyolsi
Franzenium tetradactylum
 undet. Haplobunodontidae.
- UPPER TAJO basin
- Upper Eoc., MP 20
- **Huérmece del Serro**:
Palaeotherium crassum
Palaeotherium magnum.
- CALATAYUD–TERUEL basin
- Upper Eoc., MP 20
- **Sierra Palomera**:
Theridomys cf. *golpae*
Palaeotherium sp.
- **Villarosano 1**:
Theridomys pseudosiderolithicus
Blainvillimys rotundidens
Gliravus priscus
Bransatoglis sp.
- **Villarosano 12**:
Theridomys pseudosiderolithicus
Blainvillimys rotundidens.
- SOUTH-PYRENEAN depression
 ORIENTAL or CADÍ-RIPOLL-TERRADES basin
 TERRADES sub-basin
- Lower Eoc., MP 10
- **Empordá de Terrades**:
 cf. *Lophiodon* sp.
- RIPOLLÉS-ERGUEDÀ sub-basin
- Middle Eoc., MP 14-15
- **Sant Jaume de Frontanyà 1**, MP 15:
Necrolemur sp.
Anchomomys sp.
Protadelomys sp.
Pseudoltinomys sp.
Gliravus cf. *robiacensis*

- undet. *Perissodactyla* (*Plagiolophus* sp. from Capella)
Leptotheridium sp.
Catodontherium sp.
Robiacina sp.
- **Sant Jaume de Frontanyà 2**, MP 14:
Necrolemur sp.
Plesiarctomys sp.
- **Sant Jaume de Frontanyà 3**, MP 14:
Anchomomys n. sp.
Adapis sp.
Pivetonia sp. or *Pseudoloris* sp.
cf. *Elfomys* n. sp.
undet. aff. Chapattimidae
undet. Rodentia
Saturninia sp.
undet. Palaeoryctidae
undet. Insectivora
undet. Creodonta
Metaplagiolophus atoa
undet. *Perissodactyla* (*Anchilophus* from Capella)
Robiacina n. sp.
Leptotheridium sp.
undet. Haplobunodontidae
Dichobunodontidae n. gen. n. sp.
- CENTRAL or TREMP-JACA-PAMPLONA basin
AGER sub-basin
- Lower Eoc., MP 10
- **Corsà inferior:**
Pachynolophus boixedatensis
Lophiodon cf. *remensis*
Lophiodon baroensis
Lophiodon corsaensis
archaic dichobunid.
- **Les Saleres:**
Peratherium sp.
Agerinia roselli
Cynodictis sp.
Propachynolophus remyi
Lophiaspis maurettei
Lophiodon corsaensis
Diacodexis sp.
?*Protodichobune oweni*
?*Cebochoerus* sp.
- **Poble Vell de l’Ametlla:**
Lophiodon corsaensis.
- **Corsà I:**
Lophiodon corsaensis.
- **La Masia de l’Hereuet:**
Propachynolophus remyi
Lophiodon sp. from Ager
Diacodexis sp.
- **Barranc del Guessot:**
Propachynolophus remyi
Diacodexis sp.
- **La Partida del Solà (Corsà):**
Propachynolophus remyi
- **Corsà II (Costa de Baró):**
Dissacus progressus
Pseudamphimeryx renevieri.
- **Can Camperol:**
Pachynolophus boixedatensis
Lophiodon baroensis.
- **Sant Pere Màrtir:**
Lophiodon baroensis.
- **Mas de Mingueretxo:**
undet. Ceratomorpha.
- **Localidad VI:**
undet. Ceratomorpha.
- **Costa de Baró (Corsà III):**
Propachynolophus remyi
Lophiodon baroensis
Diacodexis sp.
- **M-2 (Cami de la Masia de l’Hereuet):**
Lophiodon baroensis.
- **Corral de l’Andreu Sud IV:**
Lophiodon baroensis.
- **Corral de l’Andreu Nord I:**
Lophiodon cf. *remensis*.
- TREMP-GRAUS sub-basin
Montllobar area
- Lower Eoc., MP 10
- **Barranc de Forals:**
Phenacodus villaltae
Spaniella carezi
Propachynolophus sp. from Barranc de Forals.
- **Montllobar** (undeterminate localities):
Propachynolophus remyi
Propachynolophus sp. from Barranc de Forals
Lophiaspis baicherei.
- **Torre del Moro:**
Almogaver condali

- Chasmothorium* sp.
cf. *Lophiaspis* sp.
- **Sobrenoguera:**
Almogaver condali
Lophiaspis baicherei.
- **Repeu del Güaita:**
Phenacodus cf. *teillardi*
Plesiarctomys sp.
Lophiaspis cf. *occitanicus*
Dacrytherium sp.
- **Les Oliveres:**
Lophiaspis cf. *occitanicus*.
- Pont de Montanyana area
- Lower Eoc., MP 10
- **Escarlà:**
Agerinia roselli
Propachynolophus remyi.
- **La Ribereta:**
Propachynolophus remyi.
- **Central ENHER:**
Propachynolophus remyi.
- **Sant Miquel:**
Pachynolophus boixedatensis
Lophiodon baroensis.
- **Mas de Faro:**
undet. *Perissodactyla*
Lophiodon baroensis.
- **Km. 86:**
Pachynolophus boixedatensis
Hyrachius modestus.
- **Km. 87:**
Pachynolophus boixedatensis.
- **Santes Creus (East):**
Pachynolophus boixedatensis.
- **Santes Creus (North):**
undet. *Perissodactyla*.
- **Litera (Torre de Baró):**
undet. *Creodonta*
undet. *Perissodactyla*
Lophiodon cf. *remensis*.
- Middle Eoc., MP 11 or 12
- **Casa Ramón**
Agerinia sp.
Pseudoloris sp.
- Plesiarctomys* cf. *hartenbergeri*
Eogliravus moltzeri
Protadelomys nievesae.
- ISÀVENA sub-basin
- Lower Eoc., MP 10
- **La Roca:**
Propachynolophus sp.
Pachynolophus boixedatensis
Lophiodon baroensis.
- **El Pueyo:**
Phenacodus teilhardi
Propachynolophus remyi
undet. *Ceratomorpha*
Diacodexis sp.
- **Les Badies:**
Agerinia roselli
Propachynolophus remyi
Diacodexis sp.
- **Montderoda:**
Propachynolophus remyi
Lophiodon cf. *remensis*.
- **Güell I:**
Agerinia roselli.
- **Güell II:**
Diacodexis sp.
- **Güell III:**
Cantius sp.
Lophiodon baroensis.
- **Castigaleu:**
Agerinia roselli
undet. *Creodonta*
Phenacodus sp.
Dissacus cf. *bleyaci*
Propachynolophus remyi
Hyrachius modestus
undet. *Artiodactyla*.
- **Can Picantón:**
Agerinia roselli
Pachynolophus boixedatensis
undet. *Ceratomorpha*.
- **La Boixedat:**
Sinopa sp.
Proviverra sp.
Pachynolophus boixedatensis
Lophiodon cf. *remensis*.
- **Torrelabelad:**
Lophiodon cf. *remensis*.

– **Capella:**

Paramys sp.
Leptadapis priscus
Leptadapis (=Arisella) capellae
Pseudoloris (Pivetonia) isabena
Lophiodon rhinoceros
Plagiolophus sp. from Capella
 undet. *Perissodactyla (Anchilophus)* sp. from
 Capella)
Cebochoerus (Gervachoerus) suillus
 ?*Pseudamphimeryx* sp.
 undet. *Artiodactyla* sp. I
 undet. *Artiodactyla* sp. II.

– **Graus:**

Lophiodon rhinoceros.

– **Lagarres:**

Peratherium sp.
 undet. *Leptictidae*
Gliravus cf. *robiacensis*
Paradelomys sp.
Sciuroides sp.
Elphomys sp.
Xiphodon sp.

– **Barranco de Estarán:**

Protadelomys sp.

POBLA DE SEGUR sub-basin

Upper Eoc., MP 17

– **Sossís:**

Peratherium laverghense
Peratherium perrierense
Leptictis sp.
Saturninia pyrenaica
Leptadapis cf. *ruetimeyeri*
Pseudoloris parvulus
Microchoerus erinaceus
Sciuroides intermedius
Treposciurus mutabilis
Estellomys ibericus
Paradelomys crusafonti
Theridomys euzetensis
Pseudoltinomys cf. *phosphoricus*
Elphomys parvulus
Gliravus robiacensis
Miniglis minor
Gliravus meridionalis
Gliravus pyrenaicus
 undet. *Apatemyidae*
Hyaenodon minor
Miacis exilis
Palaeotherium magnum stehlini
Palaeotherium medium euzetense

Palaeotherium crassum sossisensis
Palaeotherium sp.
Plagiolophus annectens
Cebochoerus (Cebochoerus) lacustris
Catodotherium sp.
Dacrytherium ovinum
Leptotheridium lugeoni
Haplomeryx euzetensis
Xiphodon intermedius
 ?*Dichodon cervinum*.

– **Roc de Santa:**

Leptadapis magnus
Necrolemur antiquus
Theridomys euzetensis
Estellomys ibericus
Elfomys parvulus
Suevosciurus (Treposciurus) mutabilis
Gliravus priscus
Gliravus meridionalis
Gliravus hispanicus
Hyaenodon minor
Hyaenodon requieni
Viverravus sp.
Palaeotherium medium euzetense
Palaeotherium curtum villerealeense
Palaeotherium crusafonti
Palaeotherium sp.
Plagiolophus annectens
Lophiotherium cervulum
Anchilophus dumasi
Anchilophus gaudini
Choeropotamus sudrei
Dacrytherium ovinum
Leptotheridium lugeoni
Dichodon cervinum
Xiphodon intermedius
Haplomeryx euzetensis.

– **Claverol:**

Gliravus priscus
Gliravus meridionalis
Gliravus hispanicus.

CENTRAL CATALONIAN basin

BAGES sub-basin

Upper Eoc., MP 20 to 21

– **Costa de la Vila (= Santpedor):**

Plagiolophus annectens
Palaeotherium medium
 undet. anoplotherid.

– **Sallent:**

Palaeotherium sp.

- **Can Magrans:**
Adelomys sp.
 - **Balsareny:**
Palaeotherium magnum.
 - **Balsareny (Fondina highway):**
undet. Theridomyidae
Palaeotherium magnum.
 - **Riera de Tordell:**
Palaeotherium magnum.
 - **Cardona:**
Elomeryx sp.
- MOYÀ sub-basin
- Upper Eoc., MP 19
- **Sant Cugat de Gavadons:**
Peratherium sp.
Pseudoloris reguanti
Necrolemur sp.
Microchoerus ornatus
Saturninia cf. *tobieni*
Pairomys crusafonti
Theridomys golpeae
Pseudoltinomys cuvieri
Elphomys cf. *nanus*
Gliravus priscus
Blainvillimys aff. *rotundidens*
Moiachoerus simpsoni
Dichodon cf. *frohnstettense*
Dichodon cervinum
Xiphodon gracile.
- IGUALADA sub-basin
- Middle Eoc., MP 15
- **Pontils 26:**
undet. Lipotyphla
Pseudoltinomys cosetanus
Suevosciurus cf. *romani*
Paradelomys sp.
 - **Pontils 38:**
undet. Lipotyphla
Elphomys sp.
Omomyidae gen. sp.
- Upper Eoc., MP 19
- **Roquefort de Queralt:**
Pairomys cf. *crusafonti*
- Gliravus priscus*
Cuvierimops sp.
- EBRO basin (Catalanides, SE sector)
Ulldemolins area
- Lower Eocene, MP 8-9
- **Les Vinyes (= Poboleda):**
undet. Perissodactyla.
- Lower Eoc., MP 10
- **La Coma (= La Morera del Montsant 2):**
undet. Marsupialia
undet. Tillodonta
Agerinia sp.
Cantius sp.
Microparamys (*Sparnacomys*) cf. *chandoni*
Microparamys sp.
aff. *Proviverra* sp.
Propachynolophus sp. from La Morera
Diacodexis sp.
- Lower-Middle Eoc., MP 10-11
- **Ulldemolins I:**
?Anchomominii
Microparamys (*Sparnacomys*) cf. *parvus*
Microparamys (*Patroгна*) sp.
Propachynolophus sp. from Ulldemolins
undet. Diacodexidae I
undet. Diacodexidae II.
 - **Molí del Pont:**
Microparamys n. sp.
Pachynolophus molipontiensis
Lophiaspis cf. *occitanicus*.
 - **Cabra del Camp:**
undet. Dichobunidae.
 - **Montblanc:**
undet. Anchomominii.
 - **Coll de Lilla:**
undet. Anchomominii.
 - **Vimbodí:**
Eucricetodon aff. *atavus*
Bransatoglis n. sp.

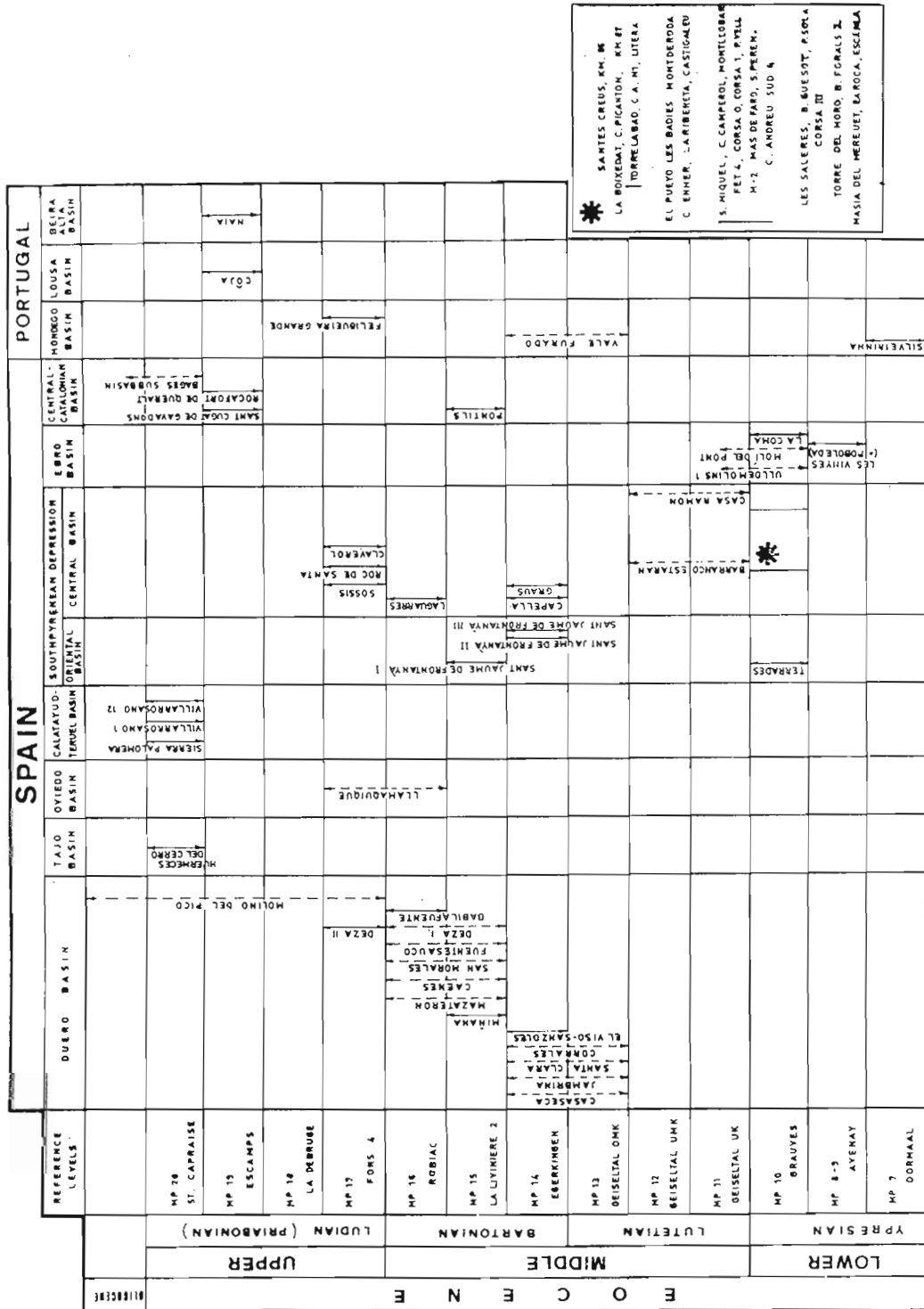


Figure 2. --- Iberian Eocene mammal sites and chronology (Mammal-units from MP 7 / Dormaal until MP 20 / Saint-Capraise).

CONCLUSIONS

1. In our present state of knowledge, Iberian Eocene mammals range from Lowermost, MP 7 Dormaal mammal unit, until the Upper Eocene, MP 20 Saint-Capraise mammal-unit (Fig. 2).
2. The earlier fauna, only known from Silveirinha, is close to the Paleocene-Eocene limit; it cannot be excluded that it could be Late Paleocene in age.
3. There are several Lower Eocene sites in Spain, mainly in the Central basin of the South-Pyrenean Depression; reported to the MP 10 (Grauves) unit (34 sites).
4. The Middle Eocene faunas are represented in the Duero basin, with 12 localities ranging from MP 13 (Geiseltal Obere Mittelkohle) to MP 16 (Robiac); in Portugal, in the Mondego basin at Vale Furado the Middle Eocene levels may be ascribed to *ca.* MP 13 or MP 14 (Egerkingen $\alpha+\beta$); 5 localities, MP 14 to MP 15 (La Livinière) are known in the Eastern and Central basins of the South Pyrenean Depression.
5. The lower Upper Eocene yielded good material in the Duero basin at Deza, in Oviedo basin at Llamaquique, and in the Central South Pyrenean basin at Sossís, Roc de Santa and Claverol, MP 17 (Fons 4) unit; in the Mondego basin, a few fossils from Feligueira Grande may be reported to the same unit.
6. Still in Upper Eocene but after the paroxysmal Pyrenean event, there are some data from Cõja, Lousã basin, and Naia, Beira Alta, in Portugal-MP 19 (Escamps); the same unit is represented at Sant Cugat de Gavadons and Rocafort de Queralt in the Central Catalanian basin.
7. The latest Eocene MP 20 (Saint-Capraise) unit faunas are represented in the Calatayud-Teruel basin at Sierra Palomera and Villarroso; and probably in the Upper Tagus basin at Huérmeces del Cerro, and in the Bages sub-basin (Central Catalanian basin).
8. More data and accurate comparisons with more or less the same age faunas from France (and elsewhere in Europe) and North Africa are needed for interpretation of migration pathways, regional faunal differentiation, and ecology.

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REFERENCES

- ADROVER, R., FEIST, M., GINSBURG, L., GUÉRIN, C., HUGUENEY, M. & MOISSENET, E., 1983.— Les formations continentales paléogènes de la Sierra Palomera (province de Teruel, España) et leur place dans la biostratigraphie tertiaire des Chaînes Ibériques orientales. *Bulletin de la Société géologique de France*, 7, 25 (3): 421-431.
- ANTUNES, M.T., 1964.— Présence du genre *Palaeotherium* CUV. (Equoidea, Mammalia) dans les argiles de Cõja (Arganil)/ Considérations sur l'âge et l'extension des formations éocènes au Portugal. *Revista da Faculdade de Ciências de Lisboa*, 2^a série C, 12 (1): 103-122.
- ANTUNES, M.T., 1967.— Dépôts paléogènes de Cõja: nouvelles données sur la Paléontologie et la Stratigraphie / Comparaison avec d'autres formations paléogènes. *Revista da Faculdade de Ciências de Lisboa*, 2^a série C, 15 (1): 69-111.
- ANTUNES, M.T., 1975.— *Iberosuchus*, crocodile Sebescosuchien nouveau, l'Eocène ibérique au Nord de la Chaîne Centrale, et l'origine du canyon de Nazaré. *Comunicações dos Serviços Geológicos de Portugal*, 59: 285-330. [Stratigraphy and mammal occurrences are dealt with].
- ANTUNES, M.T., 1979.— Ensaio de síntese crítica acerca do Cretácico terminal e do Paleogénico de Portugal. *Ciências da Terra* (Universidade Nova de Lisboa), 5: 145-174.
- ANTUNES, M.T., 1981.— As areias e argilas de Silveirinha / II - Aspectos paleontológicos. *Memórias e Notícias, Publicações do Museu e Laboratório Mineralógico e Geológico, Universidade de Coimbra*, nº 91-92: 255-267.
- ANTUNES, M.T. & RUSSELL, D.E., 1981.— Le gisement de Silveirinha (Bas Mondego, Portugal): la plus ancienne faune de Vertébrés éocènes connue en Europe. *Comptes Rendus de l'Académie des Sciences*, Paris, Série D, 293: 1099-1102.
- ANTUNES, M.T., 1986a.— *Paralophiodon* cf. *leptorhynchum* (Tapiroidea, Mammalia) à Vale Furado: contribution à la connaissance de l'Eocène au Portugal. *Ciências da Terra* (Universidade Nova de Lisboa), 8: 87-98.
- ANTUNES, M.T., 1986b.— *Anoplotherium* (Mammalia, Artiodactyla) et *Geochelone* (Reptilia, Testudines) à Cõja: les vertébrés fossiles et l'Eocène supérieur au Portugal. *Ciências da Terra* (Universidade Nova de Lisboa), 8: 99-110.
- ANTUNES, M.T., 1992.— Contributions to the Eocene Palaeontology and Stratigraphy of Beira Alta, Portugal. I - A Synoptical table. *Ciências da Terra* (Universidade Nova de Lisboa), 11: 77-81.
- ANTUNES, M.T., 1992.— Contributions to the Eocene Palaeontology and Stratigraphy of Beira Alta, Portugal. II - New late Eocene mammalian remnants from Cõja, Portugal and the presence of *Palaeotherium magnum* CUVIER. *Ciências da Terra* (Universidade Nova de Lisboa), 11: 83-89.

- ANTUNES, M.T., 1995.— On the Eocene Equid (Mammalia) from Feligueira Grande, Portugal, *Paranchilophus lusitanicus* (GINSBURG 1965). Taxonomic status, Stratigraphic and Paleogeographical meaning. *Comunicações*, Instituto Geológico e Mineiro, 81: 57-72.
- ANTUNES, M.T. & BROIN, F. DE, 1977.— ?*Cheirogaster* sp. (O. Testudines, fam. Testudinidae, *Geochelone* s.l.) du Paléogène de Naia, Tondela et l'âge du gisement. *Ciências da Terra* (Universidade Nova de Lisboa), 3: 179-195. [Also referring some mammalian remnants].
- ANTUNES, M.T., ESTRAVÍS, C. & RUSSELL, D.E., 1987.— A new Condylarth (Mammalia) from the early Eocene of Silveirinha, Portugal. *Münchner Geowissenschaftliche Abhandlungen*, A, 10: 219-224.
- BARGALLO, M., 1931.— Yacimiento de Vertebrados en Huérmeces del Cerro (Guadalajara). *Boletín de la Sociedad Española de Historia Natural*, 31: 3-8.
- BARROIS, Ch., 1878.— Mémoire sur le terrain Crétacé du bassin d'Oviedo (Espagne). *Annales de la Société Géologique du Nord*, 10: 1-40.
- BATALLER, J.R., 1942.— El *Anoplotherium commune* Cuv. del Eocénico de Sossís. *Las Ciencias*, A. VIII, 3: 1-5.
- BERGOUNIOUX, F.M., 1957.— *Asturichelys multicostatus* n.gen. n.sp. *Monografía Geológica*, 4: 1-13.
- BUSQUETS, P., RAMOS-GUERRERO, E., MOYA, S., AGUSTI, J., COLOMBO, F., CHECA, Ll. & KÖHLER, M., 1992.— La Formación de Bellmunt (Unidad del Cadf, Pirineo oriental): aportaciones bioestratigráficas de los sistemas lacustres y palustres asociados. *Acta Geológica Hispánica*, 27, 1-2: 109-116.
- CALDERÓN, S., 1902.— Noticia del descubrimiento de huesos fósiles en una caliza terciaria de Villamayor (Salamanca). *Boletín de la Real Sociedad de Historia Natural de España*, 2: 230-231.
- CASANOVAS-CLADELLAS, M.L., 1975.— Estratigrafía y Paleontología del yacimiento ludiense de Roc de Santa (Area del Noguera-Pallaresa). *Paleontologia i Evolució*, 10: 1-158.
- CASANOVAS-CLADELLAS, M.L., CHECA-SOLER, LL. & SANTAFÉ-LLOPIS, J.Vte., in press.— Los Perisodáctilos del yacimiento ludiense de Sossís (Cuenca Prepirenaica, Lleida, España).
- CASANOVAS-CLADELLAS, M.L. & SANTAFÉ-LLOPIS, J.Vte., 1987.— *Cantabrotherium truyolsi* nov. gen. nov. sp. (Palaeotheriidae, Perissodactyla), un exemple d'endémisme dans le Paléogène ibérique. *Münchner geowissenschaftliche Abhandlungen*, A, 10: 243-252.
- CASANOVAS-CLADELLAS, M.L. & SANTAFÉ-LLOPIS, J.Vte., 1989.— Dos nuevos paleotéridos (Mammalia, Perissodactyla) del yacimiento eocénico de Llamaquique (Oviedo). *Trabajos de Geología*. Universidad de Oviedo, 18: 37-52.
- CASANOVAS-CLADELLAS, M.L. & SANTAFÉ-LLOPIS, J.Vte., 1992.— Los paleotéridos de Llamaquique (Oviedo, España). In: M.L. CASANOVAS-CLADELLAS, J.Vte. SANTAFÉ-LLOPIS & J. TRUYOLS (Coords.), El yacimiento eocénico de Llamaquique (Oviedo, España) y su contenido paleontológico. *Boletín de Ciencias Naturales*, Instituto de Estudios Asturianos, 41: 101-188.
- CHECA-SOLER, Ll., 1994.— Los Perisodáctilos del Eoceno catalán. Thesis Universidad de Barcelona, 383 p. [typed].
- CHECA-SOLER, Ll. & CASANOVAS-CLADELLAS, M.L., 1989-1990.— El Eoceno español: los yacimientos y sus faunas. *Paleontologia i Evolució*, 13: 17-39.
- CHOFFAT, P., 1950.— Géologie du Cénozoïque du Portugal. *Comunicações dos Serviços Geológicos de Portugal*, 30 (Suplemento): 9-182.
- CRUSAFONT, M., 1956.— Otro nuevo condilartro del Luteciense Pirenaico. *Bolletino della Società Geologica Italiana*, 75: 3-8.
- CRUSAFONT, M., 1958.— Los Mamíferos del Luteciense superior de Capella (Huesca) (Nota preliminar). *Notas y Comunicaciones del Instituto Geológico y Minero de España*, 50: 259-279.
- CRUSAFONT-PAIRÓ, M. & CASANOVAS-CLADELLAS, M.L., 1973.— Mammalia Tertiaria Hispaniae. *Fossilium Catalogus I: Animalia*. Editus Westphal. Junk, W. s' Gravenhage, 198 p.
- CRUSAFONT, M. & GOLPE, J.M., 1973.— Yacimientos del Eoceno prepirenaico (Nuevas localidades del Cuisiense). *Acta Geológica Hispánica*, 7 (3): 81-83.
- CRUSAFONT, M. & GOLPE, J.M., 1974.— Nuevos yacimientos del Terciario continental del N.E. de España. *Acta Geológica Hispánica*, 9 (3): 81-83.
- CRUSAFONT, M., MELENDEZ, B. & TRUYOLS, J., 1960.— El yacimiento de Vertebrados de Huérmeces del Cerro (Guadalajara) y su significado cronoestratigráfico. *Estudios Geológicos*, 16: 243-254.
- CRUSAFONT, M., RENZI, M. DE & CLAVELL, E., 1968.— Les grands traits d'une coupure crétacé-paléocène-éocène au sud des Pyrénées (Isábena). *Mémoires du Bureau de Recherches géologiques et minières*, 58: 591-596.
- CRUSAFONT, M. & ROSELL, J., 1965.— Primera datación de los tramos superiores del Eoceno Continental de la Cuenca de Ager (provincia de Lérida). *Notas y Comunicaciones del Instituto Geológico y Minero de España*, 83: 79-92.
- CRUSAFONT, M. & TRUYOLS, J., 1957.— Algunas precisiones sobre la edad y extensión del Paleógeno de las provincias de Salamanca y Zamora. *Cursillos y Conferencias del Instituto "Lucas Mallada"*, 4: 83-85.
- CRUSAFONT, M. & VILLALTA, J.F., 1954.— *Almogaver* un nuevo primate del Eoceno Pirenaico. *Estudios Geológicos*, X, 22: 1-12.
- CRUSAFONT, M., VILLALTA, J.F. & TRUYOLS, J., 1956.— Caracterización del Eoceno continental de Tremp y edad de la orogénesis pirenaica. *Actes II Congrès International d'Études pyrenéennes*, 2 (1): 39-52.
- CUESTA, M.A., 1988.— Perisodáctilos del Eoceno de la Cuenca del Duero. *IV Jornadas de Paleontología*, Salamanca, Resumen: 34.
- CUESTA, M.A., 1991.— Perisodáctilos del Eoceno de la Cuenca del Duero. Thesis, Facultad de Ciencias Biológicas, Universidad de Salamanca, 322 p. [typed].
- CUESTA, M.A., 1993.— Los Palaeotheriidae (Perissodactyla, Mammalia) del Eoceno de la Cuenca del Duero (Castilla y León, España). *Estudios Geológicos*, 49: 87-109.
- CUESTA, M.A., 1994a.— Los Lophiodontidae (Perissodactyla, Mammalia) del Eoceno de la Cuenca del Duero (Castilla y León, España). *Studia Geologica Salmanticensis*, 29: 23-65.

- CUESTA, M.A., 1994b.– Los Pachynolophinae (Equoidea, Perissodactyla, Mammalia) del Eoceno de la Cuenca del Duero (Castilla y León, España). *Studia Geologica Salmanticensis*, 30: 21-63. X
- CUESTA, M.A., 1994c.– Los Plagiolophinae (REMY, 1976) nuevo rango (Perissodactyla, Mammalia) del Eoceno de la Cuenca del Duero (Castilla y León, España). *Estudios Geológicos*, 50: 253-279. X
- CUESTA, M.A., 1996.– Primeros hallazgos de Lophiodontidae (Perissodactyla, Mammalia) en el yacimiento Eoceno de Mazaterón (Cuenca del Duero, España): implicaciones biostratigráficas. *Studia geologica Salmanticensis*, 32: 39-48. X
- CUESTA, M.A. & JIMÉNEZ, E., 1994.– Síntesis del Paleógeno del borde oriental de la Cuenca de Almazán (Soria): Vertebrados de Mazaterón. *Studia geologica Salmanticensis*, 29: 157-170. X
- CUESTA, M.A., JIMÉNEZ, E. & GIL-TUDANCA, S., 1993.– Fuentesauco: un nuevo yacimiento de Vertebrados en el límite Eoceno medio-Eoceno superior, de la provincia de Zamora. In: GONZALEZ DONOSO (Ed.), Comunicaciones de las IX Jornadas de Paleontología, 91-92. X
- ESCHWEGE, Guilherme Barão d', 1831.– Memoria Geognostica ou Golpe de vista do Perfil das estratificações das diferentes rochas, de que he composto o terreno desde a Serra de Cintra na linha de Noroeste a Sudoeste até Lisboa, atravessando o Tejo até á Serra da Arrabida, e sobre a sua idade relativa. *Memórias da Academia Real das Sciencias de Lisboa*, 11 (1): 253-280.
- ESTRAVÍS, C., 1990.– *Russellmys denisae*, un nouvel apatemyidé (Mammalia) de Silveirinha, Eocène inférieur du Portugal. *Géobios*, 23 (6): 761-765.
- ESTRAVÍS, C., 1992.– Estudo dos mamíferos do Eocénico inferior de Silveirinha (Baixo Mondego). Thesis Universidade Nova de Lisboa, 248 p.
- ESTRAVÍS, C., 1994.– *Microparamys paisi*, un nouvel Ischyromyidae (Rodentia) de l'Éocène inférieur de Silveirinha (Baixo Mondego, Portugal). *Comptes Rendus de l'Académie des Sciences*, Paris, (2), 318: 417-420.
- ESTRAVÍS, C. & RUSSELL, D.E., 1989.– Découverte d'un nouveau *Diacodexis* (Artiodactyla, Mammalia) dans l'Eocène inférieur de Silveirinha, Portugal. *Palaeovertebrata*, 19 (1): 29-44.
- ESTRAVÍS, C. & RUSSELL, D.E., 1992a.– The presence of Taeniodonta (Mammalia) in the Early Eocene of Europe. *Ciências da Terra* (Universidade Nova de Lisboa), Lisboa, 11: 191-201.
- ESTRAVÍS, C. & RUSSELL, D.E., 1992b.– *Paschatherium marianae*, un nouveau Condylarthra de Silveirinha, Eocène inférieur du Portugal. *Bulletin du Muséum national d'Histoire naturelle*, Paris, 4è série, 14, 1992, C, 2: 185-203.
- FRANZEN, J.L., 1968.– Revision der Gattung *Palaeotherium* CUVIER, 1804 (Palaeotheriidae, Perissodactyla, Mammalia). Thesis Freiburg i. Breisgau Universität, 181 p. X
- GERVAIS, P., 1859.– Zoologie et Paléontologie françaises. 2d edit. Paris, 554 p. X
- GIL Y MAESTRE, A., 1880.– Descripción física y minera de la Provincia de Salamanca. *Memorias y Comunicaciones Mapa Geológico de España*: 1-229. X
- GINSBURG, L. & ZBYSEWSKI, G., 1965.– Découverte de vertébrés paléogènes dans la falaise de Feligueira Grande entre S. Pedro de Muel et Nazaré. *Comunicações dos Serviços Geológicos de Portugal*, 48: 97-108. X
- GOLPE-POSSE, J.M., 1971.– Suiformes del Terciario español y sus yacimientos. Thesis Universidad de Barcelona, 565 p. [typed].
- GONZALEZ-REGUERAL, J. & GOMEZ DE LLARENA, J., 1926.– Hallazgo de restos fósiles de un mamífero terciario en Oviedo. *Boletín de la Real Sociedad Española de Historia Natural*, 26: 399-406.
- HERNANDEZ-PACHECO, E., 1915.– Estratigrafía y Paleontología del Mioceno de Palencia. *Comunicaciones de Investigaciones Paleontológicas y Prehistóricas*, 5: 1-295. X
- HERNANDEZ-PACHECO, E., 1943.– Observaciones respecto al Paleógeno continental hispánico. *Las Ciencias*, 8 (3): 545-555. X
- JIMÉNEZ-FUENTES, E., 1977.– Redescrición de *Asturichelys multicosatus* BERGOUNIOUX (emend.), Quelonio del Ludense de Oviedo. *Studia Geologica Salmanticensis*, 12: 193-210. X
- JIMENEZ, E., CUESTA, M.A., MARTIN, S., MULAS, E., PEREZ, E. & JIMENEZ, S., 1989.– Primera nota sobre los vertebrados del Eoceno superior de Mazaterón y Deza (Soria). *Studia Geologica Salmanticensis*, 25: 59-66. X
- LOPEZ, N., 1982.– Paleontología de la hoja 479 (Peñaranda de Bracamonte). *Mapa Geológico de España* 1:50 000, IGME. X
- MALLADA, L., 1904.– Explicación del Mapa Geológico de España. V: Sistemas Infracretáceo y Cretáceo. *Memorias y Comunicaciones del Mapa Geológico de España*: 1-115. X
- MIQUEL, M., 1906.– Restos fósiles de Vertebrados encontrados en San Morales (Salamanca). *Boletín de la Real Sociedad Española de Historia Natural*, 6: 352-357. X
- MOYA-SOLA, S., 1992.– El Artiodáctilo (Mammalia) del Eoceno de Llamaquique. *Boletín Ciencias Naturales, Instituto de Estudios Asturianos*, 41: 197-200.
- PELAEZ-CAMPOMANES, P., 1993.– Micromamíferos del Paleógeno continental español. Sistemática, biocronología y paleoecología. Thesis Universidad Complutense de Madrid, 388 p. [typed].
- PELAEZ-CAMPOMANES, P., DE LA PEÑA, A. & LOPEZ, N., 1989.– Primeras faunas de mamíferos del Paleógeno de la Cuenca del Duero. *Studia Geologica Salmanticensis*, Volumen Especial 5: 135-137. X
- PUIG Y LARRAZ, G., 1883.– Descripción física y geológica de la provincia de Zamora. *Memorias y Comunicaciones del Mapa Geológico de España*: 1-290. X
- RIBA, O., 1957.– Livret-Guide de l'excursion C2: Terrasses du Manzanares et du Jarama aux environs de Madrid. *INQUA, V International Congress*.
- ROMAN, F. & ROYO Y GÓMEZ, J., 1922.– Sur l'existence de mammifères lutétiens dans le bassin du Douro (Espagne). *Comptes Rendus de l'Académie des Sciences*, Paris, 175: 1221-1223. X
- ROYO Y GÓMEZ, J., 1927.– Découverte de restes de *Palaeotherium magnum* dans la Péninsule Ibérique. *Comptes Rendus Sommaires de la Société Géologique de France*, (3): 25-27.
- ROYO Y GÓMEZ, J. (1928).– Sesión del 3 de Octubre de 1928 de la R. Soc. Esp. Hist. Nat. *Real Sociedad Española de Historia*

- ria Natural*, 28: 418.
- TRUYOLS, J. & GARCÍA-RAMOS, J.C., 1991.— El Terciario de la Cuenca de Oviedo y el yacimiento de Vertebrados de Llamaquique. *Boletín Ciencias Naturales, Instituto de Estudios Asturianos*, 41: 77-99.
- VILANOVA, J., 1873.— Noticias de Vertebrados hallados en Sanzoles (Zamora). *Actas Sociedad Española de Historia Natural*, 2: 41-42, 47 and 52.
- VILLALTA, J.F. & CRUSAFONT, M., 1944.— Nota bibliográfica al trabajo de Bataller, J.R. "El *Anoplotherium commune* CUV. del Eoceno superior de Sossís". *Boletín de la Real Sociedad Española de Historia Natural*, 42 (1-2): 165.