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Supporting Information for

European mammal turnover driven by a global rapid warming event preceding the Paleocene-Eocene Thermal Maximum

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Supporting Information Text

Systematic Paleontology

1- Addition to the Fordones/LeClot fauna

Order Perissodactyla Owen, 1848
Suborder Hippomorpha Wood, 1937
Superfamily Equoidea Gray, 1821

***Cymbalophus hookeri* Godinot, 1987**
Fig.S2n-n'

Material.— UM-FDN-290, m1 (left)
Discussion.—The trigonid of this small half lower molar from Fordones is broken but the preserved part of the metaconid shows that this cuspid was twinned (presence of a large metastylid) and connected to the protoconid by a high notched protolophid (Fig.S2n-n'). The cristid obliqua is oriented lingually and reaches the midway of the protolophid. The entoconulid is high on the entocristid. The hypolophid, constituted by the endohypocristid and the endoentocristid, is concave. The reduced hypoconulid is isolated from the hypoconid (the posthypocristid is lacking). A weak postentocristid is present, pointing towards the hypoconulid.

The small size, moderate lophodonty, and the reduced and isolated hypoconulid are characteristics of *Cymbalophus*. Noteworthly, in *Pliolophus*, the degree of lophodonty is lesser and the posthypocristid is present and connects the hypoconid to the hypoconulid. *Cymbalophus* is known by the two-following species, *C. cuniculus* from the MP7 localities of Kyson (UK, type-locality) and Erquelinnes (Belgium), and *C. hookeri* from the ~MP7 localities of Palette (type-locality), Fournes, and Monze (Southern France) (Godinot et al. 1987[1], Marandat 1991[2], Hooker 1994[3], Missiaen et al. 2013[4]). The molar from Fordones is attributed to *C. hookeri* due to its similar size and lingual position of the cristid obliqua. *Cymbalophus cuniculus* is larger and presents a more labial cristid obliqua.

2- Albas fauna

Class MAMMALIA Linnaeus, 1758
Infraclass METATHERIA Huxley, 1880
Family HERPETOTHERIIDAE (Trouessart, 1879)
***Peratherium* Aymard, 1850**
***Peratherium* sp.**
Fig.2m-o (main text)

Material.— UM-ALB-12, ?m2 (left); UM-ALB-23, lingual part of ?M2 (right); UM-ALB-25, labial part of ?M3 (left).
Measurements.— UM-ALB-12: L=1.37, W=0.71
Discussion.— The complete lower molar has no labial cingulum, a low and mesially projected paraconid with a paraconid keel, a lingually positioned and distally projected hypoconulid, a relatively high entoconid, a lingual alignment of paraconid, metaconid, and entoconid, and a notch between the closely positioned entoconid and hypoconulid (Fig.2m). The upper molars have a V-shaped centrocrista, a metacone higher than the paracone, well-developed stylar cusps B and C and pronounced conules (Fig.2n-o).

All these characters are indicative of the family Herpetotheriidae and suggest affinities with *Herpetotherium* and *Peratherium*. Korth (1994[5], 2008[6]) considered that *Peratherium* was restricted to Europe and that most North American species included in *Peratherium* were more properly allocated to *Herpetotherium* (Williamson et al. 2012[7]). It is generally accepted that these two genera differ by their stylar shelf: *Herpetotherium* has stylar cusp C or D most prominent, whereas stylar cusp B is dominant in *Peratherium* (Korth 1994[5]). However, this distinction is tenuous and some exceptions exist (e.g., *Herpetotherium knighti* has a prominent stylar cusp B). This led several authors to maintain most North American herpetotheriids from the Wasatchian (earliest Eocene) within the genus *Peratherium* (e.g., Gingerich and Smith 2006[8], Beard and Dawson 2009[9]). For instance, *P. innominatum* (probably including

P. macgrewi) was reported from the Wa-M and Wa-0 (Gingerich and Smith 2006[8], Rose et al. 2012[10]). As for the Paleocene, although Rose (1981:156[11]) mentioned a dentary of a possible species of *Peratherium* in the late Tiffanian (middle Paleocene), no *Peratherium* or *Herpetotherium* remain has been reported from the Clarkforkian (latest Paleocene). In Europe, herpetotheriids are also absent from known Paleocene faunas, the oldest European herpetotheriid species being *Peratherium constans* from the MP7 (earliest Eocene) of Dormaal (Ladevèze et al. 2012[12]). The presence in Europe and the diagnostic characters (with respect to *Peratherium*) of the non-North American genus *Amphiperatherium* have been questioned (Ladevèze et al. 2012[12]). In southern Europe, *Peratherium constans* is also present at Palette (~MP7, Godinot et al. 1987[1]), Fordones and Le Clot (MP7/MP8+9 interval, Marandat 1991[2]; Marandat et al. 2012[13]), and possibly Silveirinha (~MP7, Estravis 1992[14], 2000[15]). Compared to *P. constans*, the UM-ALB-12 ?m2 is smaller and exhibits an entoconid labiolingually pinched with a flat labial flank. On the fragmentary upper molar UM-ALB-25, stylar cusp B is mesially displaced on the stylar shelf over the paracone apex, while it always levels this major cusp in *P. constans*. The stylar shelf is labiolingually narrow along all its course, even at the level of the relatively low and pinched stylar cusp B (stylar cusps B and C are subequal in height), which is broader and conical in the Dormaal species. To conclude, considering that early Paleogene herpetotheriids from both Europe and North America require revision, we assign the Albas taxon to *Peratherium* sp. This probable new species documents the unique herpetotheriid marsupial known from the latest Paleocene of Europe.

EUTHERIA Gill, 1872
Grandorder *incertae sedis*
Family ADAPISORICULIDAE Van Valen, 1967
***Bustylus* Gheerbrant, 1991**
***Bustylus* sp.**
Fig.2j (main text) and Fig.S2d

Material.— UM-ALB-37, M1 (left).
Measurements.— L>1.04, W=1.19
Discussion.— This long and narrow upper molar (significant reduction of the transverse development) with a markedly mesially canted protocone is considered as an M1 (Fig.2j and Fig.S2d). Among adapisoriculids, this molar is attributed to *Bustylus* owing to its predilambdodonty, the presence of a mesostyle (partially broken however), a rectilinear centrocrista, a rather short protocone, and weak internal crests of the conules (less marked than in *Afrodon*). European adapisoriculids have been recently revised by De Bast et al. (2012[16] and 2013[17]) and De Bast and Smith (2016[18]), we follow their systematics and biochronology.

The species of *Bustylus* from Albas differs from *B. cernaysis* from Cernay and Berru (MP6a, late Thanetian) and *B. germanicus* from Walbeck and Maret (?MP5, Selandian), and Cernay and Monchenot (MP6a) by a smaller size and the presence of less developed stylar cusps. *Bustylus folieae* from Hainin (?MP2 or ?MP3) is also slightly larger and has a more transversely wider M1. By its minute size, the species of *Bustylus* from Albas is more similar to the smallest *Bustylus* ssp., namely *B. marandati* from Hainin and *Bustylus* sp. from Dormaal. *Bustylus marandati* has however more marked internal crests of the conules and a less labial orientation of the postmetacrista. *Bustylus* sp. from Dormaal, which is the unique Eocene representative of the genus *Bustylus* (Smith 1997[19]), differs from *Bustylus* sp. from Albas by a shallower ectoflexus and a paracone significantly higher than the metacone. To conclude, the adapisoriculid from Albas is the single known representative of the genus *Bustylus* for the latest Paleocene and the unique Paleogene adapisoriculid known from Southern Europe inasmuch as cf. *Adapisoriculus* sp. from Fordones (Marandat 1991[10]) was assigned to the nyctitheriid *Wyonycteris* by Smith (1995[20]).

?Adapisoriculidae
gen. et sp. indet.
Fig.S2m

Material.— UM-ALB-7, M1or2 (left).
Remark.— The two fragments of this tooth were found in association.
Discussion.— This incomplete upper molar evokes some adapisoriculids and more peculiarly *Remiculus* and *Nosella* (Russel 1964[21]; Lopez-Martinez and Pelaez-Campomanes 1999[22]) by the presence of a lingual postmetacrista joining the metastylar shelf, labially delimited by a cingulum (Fig.S2m). Other similitudes

concern the large and slightly mesial inclination of the protocone, well-marked para- and metaconulecristae, the presence of long pre– and postcingula, and the occurrence of a small lingual hypocone. UM-ALB7 differs however from the upper molars of *Remiculus* and *Nosella* in displaying a short postmetacrista and a less developped metastylar shelf.

Order *incertae sedis*
suborder *incertae sedis*
Family ?PSEUDORHYNCOCYONIDAE Sigé, 1974 (sensu Hooker 2013)
nov. gen. et sp.
Fig.2k-k' (main text)

Material.— UM-ALB-27, M1or2 (left).
Measurements.— L= 1.63, W= 2.11
Discussion.— This small-sized and transversally elongated upper molar has low conical cusps, paracone and metacone well separated, a paracone slightly taller than the metacone, concave ectoflexus, developed stylar shelf with no accessory stylar cusps, transversely flattened metacone, fairly longitudinal postmetacrista, isolated and bulbous metaconule (no trace of pre- and post-metaconulecristae), no paraconule, wide postcingulum with a tall hypocone, weak ridge (prehypocrista) linking the hypocone to the postprotocrista, no lingual cingulum, and a protocone mesially canted (Fig.2k-k').

The identification of isolated molars of early Paleogene 'insectivorous' mammals is difficult without associated premolars and molars in preserved toothrows. Despite this, the very peculiar morphology observed on UM-ALB-27 provides pertinent comparisons. Pantolestine 'proteutherians' such as *Bessoecetor* and *Palaeosinopa* are larger, their cusps are more acute, the paracone and metacone are less separated, and the hypocone is crestiform (Gunnell et al. 2008[23]). Nyctitheriid ?soricomorphs differ by more acute cusps, small conules with internal crests, crestiform to minute hypocone on a disto-lingual lobe. M1-2 of primitive members of louisinids (e.g., *Walbeckodon*, *Berrulestes* and *Paschatherium*; Hooker and Russell 2012[24]) present similitudes with UM-ALB-27 (reduction of the paraconule; large, bulbous and occasionally isolated metaconule; elevated hypocone; and prehypocrista) but differ in having more bulbous cusps, shallow to absent ectoflexus, short postmetacrista, and stronger mesial and labial cingula. Among erinaceomorphs, *Macrocranion* and *Adunator*, known from the late Paleocene of Europe differ from the Albas taxon in numerous characters; the Eocene sespedectids are more similar in showing low cusps, long postmetacrista on M1, and a mesial position of the protocone. Among the sespedectids, M1-2 of *Proterixoides* (late middle Eocene from North America) and *Scenopagus* (early to middle Eocene from North America and possibly from Europe; Krishtalka 1979:19[25]) further share with UM-ALB-27 the presence of a prehypocrista (the 'erinaceid crest'). Interestingly, the derived sespedectid *Sespedectes* from the middle Eocene of North America also has, like the Albas insectivore, a minute size, an inflated metaconule and lacks the paraconule. However, the age of *Sespedectes* –late middle Eocene– relative to that of the Albas taxon certainly indicates that similarities between both taxa are due to dental convergences; *Sespedectes* remains moreover significantly distinct by more bunodont cusps, robust cingulum, prominently projecting parastyle, and larger and higher hypocone (Novaceck 1985[26]). Comparisons of particular interest can also be made with pseudorhyncocyonids, a family of uncertain affinities, restricted to the middle Paleocene-late Eocene time interval in Europe (Hooker 2013[27]). UM-ALB-27 shares with M1-2 of pseudorhyncocyonids a transversally elongated outline, paracone and metacone well separated, paracone slightly taller than the metacone, concave ectoflexus, long postmetacrista (*Phakodon*), a paraconule subsumed within the long preprotocrista (*Phakodon*) and the isolation of the metaconule from the postprotocrista (*Phakodon* and *Fordonia*), the development of a large hypocone on a wide postcingulum (*Diaphyodectes* and *Fordonia*), the absence of lingual cingulum, and a protocone displaced mesially. In terms of size and morphology, the new genus from Albas appears intermediate between *Diaphyodectes* and *Fordonia*, although these two genera are not sister-taxa following Hooker (2013[27]).

Order EULIPOTYPHLA Waddell, Okada, and Hasegawa, 1999
Suborder ?SORICOMORPHA Gregory, 1910
Family NYCTITHERIIDAE Simpson, 1928
Remark.— the systematics among nyctitheriids follows Manz and Bloch (2014)[26].

***Plagioctenodon* Bown, 1979**

Plagioctenodon* cf. *dormaalensis
Fig.S2f-g'

Material.— UM-ALB-13, trigonid of m1or2 (right); UM-ALB-18, labial part of P4 (right); UM-ALB-16, lingual part of M1or2 (right); UM-ALB-35, labial part of M1or2 (left).
Discussion.— This species although represented by fragmentary teeth is confidently attributed to a nyctitheriid considering the semi-molariform P4 with high paracone and lower metacone joined (Fig.S2g-g'), M1or2 with prominent protocone, strong conules on pre- and postprotocristae, strong pre- and postparaconular and postmetaconular cristae, posterolingual hypoconal shelf bearing a small hypocone, and robust precingulum (Fig.S2f). On the m1or2 trigonid, the paraconid is cuspate rather than crestiform, and the metaconid and protoconid are subequal in height.

Among the few nyctitheriid genera from the Paleocene/Eocene transition, the species from Albas requires comparisons only with *Leptacodon* and *Plagioctenodon*. According to Manz and Bloch (2014)[28], all *Plagioctenodon* species (except *Plagioctenodon dormaalensis*) differ from all species classified as *Leptacodon* in having a significantly taller entoconid than hypoconid on the lower molars, rather than the two cuspids being subequal (see also Jones and Beard 2023[29]). Although the condition of this character is unfortunately unknow in the species from Albas, a precise identification is provided by other characters. *Leptacodon nascimentoi* from Silveirinha (Estravis 1992[14]) differs in being smaller and in having an incipient pericone on the M1-2 and a metaconid taller and larger than the protoconid on lower molars. Considering these characters, some species of *Plagioctenodon (P. dormaalensis*, *P. thewisseni* and *P. rosei*) and some other species of *Leptacodon* (*L. tener* and *L. donkroni*) are more evocative to the nyctitheriid from Albas. Likewise, the presence of a metacone on P4 is also found in *L. tener*, *L. catulus*, *P. rosei*, and *P. dormaalensis*. The labial displacement of the metaconule on the upper molar is similar to *P. rosei* and *P. dormaalensis* (M1-2 of *L. tener* and *L. catulus* have their paraconule and metaconule nearly equidistant to the protocone) (note however that an M2 attributed to *P. dormaalensis* from the Red Hot Local Fauna of the early Eocene of Mississippi does not have a labial metaconule, see Beard and Dawson 2009[9]). The postcingulum, bearing a small and bulbous hypocone, suggests affinity with either *P. dormaalensis* or *P. rosei* (*P. thewisseni* has a smaller and conical hypocone). *Plagioctenodon dormaalensis* is only known from the MP7 (Dormaal) (Smith 1996[30]) and *P. rosei* may be present in the Tiffanian (Secord 2008[31]) but it is primarily known from the middle through late Clarkforkian (Cf-2) (Rose 1981[11]; Gingerich 1987[32]). Following Smith (1996[30]), *P. dormaalensis* differs from *P. rosei* in its smaller size, the presence of a unique mental foramen under p3 (variable in *P. rosei*) and less molariform lower premolars. Based on its minute size (the two other characters are unknown), the species of *Plagioctenodon* from Albas is assigned to *Plagioctenodon* cf. *dormaalensis*.

***Wyonycteris* sp.**
Fig.S2e-e'

Material.— UM-ALB-19, lingual part of M1or2 (right); UM-ALB-32, lingual part of M1or2 (left).
Discussion.—Only the lingual half of two upper molars is preserved, but the high protocone, strong conules bearing marked pre- and postcristae, extended posterolingual hypoconal shelf with a cuspate and acute hypocone, and small precingulum with a distinct pericone are characteristics of the nyctitheriid *Wyonycteris* (Fig.S2e-e'). Noteworthy, the distinct pericone is absent in all other genera of the family or incipient in some specimens of *Plagioctenodon* (e.g., *P. rosei* UM 768951, *P. dawsonae* CM 70754, cf. *Plagioctenodon krausae* UW 9730) (Jones and Beard 2023[29]).

In Southern Europe, *Wyonycteris* is possibly documented by few teeth from Fordones and Rians (MP7/MP8+9 interval) (Smith 1995[20] and 1996[30]); only one fragmentary upper molar (UM-FDN-151), preserving the labial half, is known from Fordones. This specimen is compatible in size with the taxon from Albas. In Northern Europe, *Wyonycteris* is better documented and represented by *W. richardi* from Dormaal (Smith 1995[20]) and Abbey Wood (MP7/MP8+9 interval) (Hooker 2010[33]) and *W. kingi* from Croydon (~MP7) (Hooker 2018[34]). In North America, where the genus was originally described (Gingerich 1987[32]), *Wyonycteris* is documented by three or four species (see Manz and Bloch 2014[28]). The earliest known occurrences are *W. galensis* from Ti-5a and Cf-2 and *W. microtis* from the Ti-5a (Secord 2008[31]). *Wyonycteris galensis* is only represented by lower teeth and cannot be compared with the specimens from Albas. Regarding *Wyonycteris microtis,* it was proposed to be outside of the nyctitheriids (Manz and Bloch 2014[28]); it differs from both other *Wyonycteris* species and *Wyonycteris* sp. from Albas in the absence of

hypocone and pericone on the upper molars. Other North American species are *W. chalix* from the early to late Clarkforkian (Cf-2) (Gingerich 1987[32]; Gingerich and Smith 2006[8]; Jones and Beard 2023[29]) and *W. primitivus* from Wa-?M (Beard and Dawson 2009[9]). By comparison with all these European and North American species, *Wyonycteris* sp. from Albas is smaller than *W. kingi*, larger than *W. richardi* from Dormaal (type locality), and quite identical in size with *W. richardi* from Abbey Wood, *W. chalix*, and *W. primitivus*. *Wyonycteris richardi* from Abbey Wood differs however from the Albas species by weak to absent paraconule and metaconule crista. *Wyonycteris primitivus* differs from *Wyonycteris* sp. from Albas by a lesser development of the posterolingual hypoconal shelf and a smaller pericone. Finally, *W. chalix* (M2 UM 113363 from SC-29 locality, Gingerich and Smith 2006[8]) seems to be the closest relative of *Wyonycteris* sp. from Albas by a large development of the posterolingual hypoconal shelf, a high hypocone, and a metaconule slightly displaced towards the metacone. Such characters are however variable in *W. chalix* (M2 UM 769151, Gingerich 1987[32]), so they may not be meaningful taxonomically.

Nyctitheriidae indet.
Fig.S2h-h''

Material.— UM-ALB-39, m1or2 (left).
Measurements.— L≥1.49, W= 1.02
Discussion.— This lower molar is strongly canted lingually (Fig.S2h''), the trigonid cuspids are slightly inflated and have sharp tips, the trigonid is about twice as high as the talonid (Fig.S2h-h'). Judging the morphology of the protoconid in lateral view and the long, rather straight, preprotocristid, the paraconid (broken) was distant from the protoconid and very low on the crown (at the level of or lower than the talonid). The talonid basin is narrow but deep, the entoconid is smaller and more cristiform than the hypoconid, a postcristid connects together the hypoconid, hypoconulid and entoconid, the ectoflexid is large, and the exodaenodonty is pronounced.

Adapisoriculids and early erinaceomorphs (e.g., *Adunator*, *Adapisorex*, *Macrocranion*, *Litolestes*, *Diacocherus*, *Scenopagus*, and *Talpavus*) differ in most of these characters, e.g., their lower molars have larger talonid basin and are less exodaenodont and not so lingually canted. The two last characters are in contrast evocative of nyctitheriids. Subequal metaconid and protoconid, the absence of postcingulid, and the hypoconulid median and reduced are shared characters with *Leptacodon tener*, *L. donkroni*, *Plagioctenodon dormaalensis*, and *P. rosei*. However, the entoconid, which is significantly smaller and more cristiform than the hypoconid, differs from the condition observed in species of *Leptacodon* and *Plagioctenodon dormaalensis* (these species have entoconid and hypoconid subequal). Other species of *Plagioctenodon* are even more distinct in displaying an elevated entoconid, which is significantly taller than the hypoconid (see Manz and Bloch 2014[28]); among other nyctitheriids, the same is true for *Ceutholestes* (Rose and Gingerich 1987[35]). *Wyonycteris* differs in the development of its nyctalodonty (hypoconid-hypoconulid connected; entoconid isolated) (Smith 1995[20]). Noteworthy, compared to UM-ALB-39, none of these nyctitheriids has such a high-crowned lower molar and narrow talonid, nor has the distal enlargement of the hypoconid, which results from the exodaenodonty. These very peculiar characters occur, however, in some other nyctitheriids. *Limaconyssus* (Cf-2, Wyoming; Gingerich 1987[32]) has a unique configuration of the talonid, which is strongly narrower than the trigonid, and high-crowned lower molars. Some late Eocene European nyctitheriids (e.g., *Amphidozotherium*) have the distal enlargement of the hypoconid (Sigé 1976[36]). Such a character is also present in some specimens of an indeterminate nyctitheriid from Fordones (UM-FDN-237 and 246) (unpublished data).

Order *incertae sedis* (see discussion in Tabuce 2017:252)
Family LOUISINIDAE Sudre and Russell, 1982
***Paschatherium* Russell, 1964**
***Paschatherium marianae* Estravis and Russell, 1992**
Fig.2a-f' (main text) and Fig.S2a-b

Material.— UM-ALB-08, mandible with m2 and talonid of m1 (left); ?UM-ALB-29, talonid of m1or2 (left); UM-ALB-38, m1or2 (left; enamel is largely missing); UM-ALB-09, fragmentary m3 (left); UM-ALB-22, m3 (right); UM-ALB-05, DP4 (right); UM-ALB-04, P4 (right); UM-ALB-24, M1or2 (right; parastylar area missing); UM-ALB-33, M2 (right); UM-ALB-10, M3 (right); and molar fragments.

Measurements.— UM-ALB-05: L>1.50, W= 1.52; UM-ALB-04: L>1.42, W=1.84; UM-ALB-08 (m2): L=1.56, W=1.38; UM-ALB-10: L=0.97, W=1.72; UM-ALB-22: L=1.58, W=0.99; UM-ALB-33: L≥1.54, W=2.11

Discussion.—This species, which is the most dominant one recorded in the fauna, is attributed to the louisinid *Paschatherium* based on its small size, moderate bunodonty, reduced M3 and m3, semimolariform P4 (metacone present and hypocone absent), large hypocone on M1-2, lack of postparaconule crista on M3, moderate trigonid/talonid height on m1-3, and low and cristiform paraconid on m1-m3 (Fig.2a-f and Fig.S2a-b).

The species from Albas is similar to *P. marianae* from Silveirinha (Estravis and Russell 1992[37]) and *P. plaziati* from Fordones and Le Clot (Marandat 1991[2]; Marandat et al. 2012[13]) by its size, significantly smaller than *P. dolloi* and *P. russelli*; more secodont and sharp cusps compared to *P. dolloi*, *P. russelli*, and *P. yvetteae*; concave labial margins of M1-2; long postmetaconule crista connected to the postcingulum; and prominent style (long and oblique postmetacrista). Diagnostic characters of *P. marianae* are the short trigonid and straight paracristid on m1-3, the more labio-lingually elongated M1-2 (hypocone displaced lingually), and the less reduced M3. The unique difference with the tooth series of *P. marianae* from Silveirinha is the more robust DP4 having a higher and longer preprotocrista and a less labially displaced metastyle.

***Teilhardimys* Kretzoi and Kretzoi, 2000**
***Teilhardimys* cf. *reisi* (Antunes, Estravis, and Russell, 1987)**
Fig.2g-i (main text) and Fig.S2c

Material.— UM-ALB-28, DP4 (right); UM-ALB-36a, M2 (right); UM-ALB-36b lingual part of M1 (right). UM-ALB-36a and UM-ALB-36b have been found in association with a fragment of maxilla (UM-ALB-36c).
Measurements.— UM-ALB-36a: L=2.44, W±3.39
Discussion.—The large bunodont cusps, the M1 with a hypocone subequal to the protocone, the M1-3 with a high parastyle, and the M2 with a marked labial development of the paracone are typical of *Teilhardimys* (Fig.2g-I and Fig.S2c). The lack of both postprotocrista and postparaconule crista, and the occurrence of a metaconule-hypocone crest (metaloph) differ from *T. brisswalteri* and indicate affinities with *Teilhardimys reisi* or *T. musculus*. With very rare exception, these two species essentially differ on their upper molars and DP4 in the development of the paraconule, metaconule, and ectocone. On *T. musculus*, the paraconule and metaconule are weak to absent, and the ectocone is usually prominent, whereas on *T. reisi* the paraconule and metaconule are large and the ectocone is usually absent (Tabuce et al. 2006[38]). The only known exceptions concern the occurrence of a large metaconule on the NHMUK.M85483 M1 from Ferry Cliff attributed to *T. musculus* (Hooker and Russell 2012[24]); the presence of weak conules on the M2 UNLSNC−139 and SV3-10, and the occurrence of an ectocone on the UNLSNC−266 M1 from Silveirinha attributed to *T. reisi* (Tabuce et al. 2006[38]). Because the three specimens from Albas have no ectocone and have individualized conules (DP4 has large conules, M1 has a large metaconule [the paraconule area is poorly preserved], and M2 has a minute metaconule and a large paraconule), we favour comparisons with *T. reisi*. This species is only known from Silveirinha (Antunes et al. 1987[39], Tabuce et al. 2006[38]). Although all the observed characters coincide, we name the sample from Albas *Teilhardimys* cf. *reisi* because the scarcity of the material precludes comparison of most of the tooth types, especially the upper and lower posterior premolars, which highly differ between both species.

Order PRIMATES Linnaeus, 1758
Superfamily PAROMOMYOIDEA (Simpson, 1940)
Family PAROMOMYIDAE Simpson, 1940

***Arcius* Godinot, 1984**
Arcius* cf. *rougieri
Fig.2l-l' (main text)

Material.— UM-ALB-3, m2 (left)
Measurements.— L=2.08, W=1.47
Discussion.—This low crowned molar with mesio-distally compressed trigonid, tiny paraconid placed lingually, mesially inclined trigonid, and with large and shallow talonid basin illustrates a paromomyid

(Fig.2l-l'). The trigonid being as wide as the talonid indicates that this tooth is an m2 instead of an m1. The attribution to *Arcius* is supported by two characters, listed as diagnostic by López-Torres and Silcox (2018) [40]. First, compared to other genera of paromomyids, the molar trigonid is not as mesially inclined relative to the level of the base of the talonid basin. Second, the molar cuspids are relatively taller relative to the base of the crown by comparison with those of *Ignacius*.

Based on our current knowledge, *Arcius* includes six species, all are from the early Eocene of Europe (see Aumont 2003[41] for a review; López-Torres and Silcox 2018[40]; Godinot et al. 2021[42]): *A. zbyszewskii* from Silveirinha and Sotteville-sur-Mer (~MP7); *A. rougieri* from Palette (~MP7) and possibly from Fordones and Rians (MP7/MP8+9 interval); *A. hookeri* from Abbey Wood (MP7/MP8+9 interval); *A. fuscus* and *A. lapparenti* from Mutigny and Avenay (MP8+9) and other localities from Northern and Southern France, ranging from the MP7/MP8+9 interval to the MP10 (e.g., Fournes, Azillanet, and Prémontré); and *A. moniquae* from Cos (Southern France, probable MP10-MP11 interval). Note that the holotype of "*Arcius*" *ilerdensis* from Masia de l'Hereuet (Spain, MP8+9?) was recently identified as belonging to the apatemyid genus *Heterohyus* (Beard and Métais 2023[43])

The taxon from Albas differs from all these species in a weaker mesial inflection of the trigonid; it further differs from *A. hookeri* in being significantly smaller and in having a protoconid and a metaconid equally sized (the metaconid higher than the protoconid is a diagnostic character of *A. hookeri*) By its small size, the species from Albas is more evocative of *A. zbyszewskii*, *A. rougieri*, and *A. fuscus*, the smallest species of *Arcius*. It differs however from *A. zbyszewskii* (m2 CEPUNL-SV1-24) and *A. fuscus* in displaying a higher paraconid and trigonid, a more lingual orientation of the cristid obliqua, and in the presence of a robust buccal cingulid. It further differs from *A. zbyszewskii* in its slightly larger size. Considering the characters of the trigonid (the position and elevation of the paraconid and the height and mesial inclination of the trigonid), the species from Albas is similar to *A. rougieri*. The latter only differs in the lack of connection between the paraconid and the metaconid, a V-shaped hypocristid, and in displaying a rounded and lingually oriented preprotocristid (but this character can be variable in paromomyid species, for instance in *A. lapparenti*). It should be noted here that the variability of the m2 in *A. rougieri* cannot be estimated as only one specimen is documented (UM-PAT-5). To conclude, the species from Albas either illustrates a new species very close to *A. rougieri* or represents a latest Thanetian representative of this species. In any case, it documents the oldest European representative of the Paromomyidae.

Order HYAENODONTA Van Valen, 1967
Family HYAENODONTIDAE Leidy, 1869

***Arfia* Van Valen, 1965**
***Arfia* sp.**
Fig.2p-p' (main text)

Material.— UM-ALB-2, M1or2 (right).
Measurements.— L>3.00, W±3.56
Discussion.— UM-ALB-2 shares with the upper molars of the different species of *Arfia* the presence of separated paracone and metacone at mid-height, the almost equal elevation of the latter structures, the shortness of the paracone when compared to the metacone, the mesiodistal elongation of the metacone, the reduction of the stylar shelf, the presence of a metaconule, and the presence of separated pre- and postcingulum (Fig.2p-p'). UM-ALB-2 also shares with the species of *Arfia* one important feature: the presence of a mesiodistally elongated and arcuate postmetacrista that does not display the carnassial notch. Moreover, this postmetacrista shows a distinct wear facet that is present on its entire length; this facet is oriented towards the lingual part of the tooth.

The hyaenodont genus *Arfia* was established by Van Valen (1965[44]) in order to distinguish species previously included in *Sinopa*: *A. shoshoniensis* (Wa-1 to Wa-3) and *A. opisthotoma* (Wa-3). Since then, four new early Eocene species have been described: *Arfia zele* from the Wa-R (Gingerich and Deutsch 1989[45]), *A. junnei* from Wa-0 (Gingerich 1989[46]), *A. gingerichi* from MP7 (Smith and Smith 2001[47]), and *A. langebadreae* from the Bumban member of the Naran Bulak Formation, early Eocene, Mongolia (Lavrov and Lopatin 2004[48]). Finally, an eighth species from the Wutu Formation, early Eocene, China, first described as an oxyaenid by Tong and Wang (2006[49]), was referred to *Arfia* as *A. palustris* (Solé et al. 2013[50]).

The species from Albas is distinguished from all these species by its much small size; it is 30% smaller than the European *A. gingerichi*, which is considered as the smallest species of *Arfia* (Smith and Smith 2001[47]). The protocone on UM-ALB2 is V-shaped in occlusal view, whereas it is more U-shaped in the other species of *Arfia*. Additionally, the postcingulum and precingulum are less extended than in the earliest species of *Arfia* (*A. gingerichi* and *A. junnei*). These differences may represent primitive features: (1) the pre- and postcingulum tends to increase through time in *Arfia*; (2) as the protocone tends to increase mesiodistally, it loses its initial V-shaped aspect (a morphology that is present in several primitive hyaenodonts such as the oldest species of *Prototomus* [Gingerich and Deutsch 1989[45]; Smith and Smith 2001[47]]). Given these differences and evolutionary trends, UM-ALB-2 certainly represents a new species of *Arfia*, the first known in the latest Paleocene.

Order RODENTIA Bowdich, 1821
Family ISCHYROMYIDAE Alston, 1876
Subfamily REITHROPARAMYINAE Wood, 1962

***Acritoparamys* Korth, 1984**
Acritoparamys* aff. *atavus
Fig.2q-r' (main text) and Fig.S2j

Material.— UM-ALB-42, m1(right); UM-ALB-41, P4 (left); UM-ALB-43, worn M3 (right)
Remark.— UM-ALB-41 is attributed to a P4 instead of to a upper molar by the following characters: strong transverse development of the crown, weakness of the anterocingulum, close proximity of paracone and metacone, and small hypocone (almost twice smaller than the protocone) (Fig.2q-q'). UM-ALB-42 is attributed to an m1 instead to an m2 by the somewhat labiolingually narrow trigonid relative to talonid (Fig.2r-r').
Measurements.— UM-ALB-42: L=1.41, W=1.45; UM-ALB-41: L=1.22, W=1.57; UM-ALB-43: L=1.51, W=1.36
Discussion.— Following the systematics proposed by Anderson (2008)[51], this ischyromyid rodent differs from the Paramyinae (e.g., *Paramys*) in the presence of an entoconid separated from the posterolophid by a slight groove. It also differs from the Microparamyini Reithroparamyine (e.g., *Microparamys*, except *M. nanus*) in the presence of a hypocone on P4, a lower and less individualized anterolophid, and in having an entoconid not distinctly separated from the posterolophid. Comparisons with Reithroparamyini are more interesting. The ischyromyid from Albas shares indeed with *Reithroparamys* and *Acritoparamys* a molariform P4 with a hypocone present and the very simple morphology of the m1 with a distinct hypoconulid, an entoconid only separated from the posterolophid by a very slight groove, and the buccal aspect of the posterolophid posterior to the entoconid (Wood 1962[52]; Korth 1984[53]; Ivy 1990[54]; Anderson 2008[51]; Li et al. 2017[55]).

The species from Albas differs however from *Reithroparamys*, which first occurs in Wa-0 (Anderson 2008[51]), in lacking an entolophid (= the entoconid crest that runs buccally into the talonid basin), in having a less isolated entoconid, a very low and short mesial ectolophid connected to the weakly bulged mesoconid, and a lower metalophulid II (the structure composed by the postprotocristid and the lingual metalophid). The specimens from Albas are thus more evocative of *Acritoparamys*, a genus known by five North American species from the late Paleocene (early Clarkforkian, Cf-1) to the middle Eocene (Wood 1962[52]; Rose 1981[11]; Korth 1984[53]; Ivy 1990[54]; Anderson 2008[44]), an Asian species from the ?middle Eocene (Li et al. 2017)[55], and by an unpublished European species from the MP7 localities of Dormaal and Erquelinnes (Smith 1999)[56]. Among these species, only *A. atavus*, which is the oldest and smallest species of the genus, is similar in size with the species from Albas. These two species are 30-35% smaller than *A. atwateri* and *A. francesi*. Other similarities between the specimens from Albas and *A. atavus* (specimens from Clarks Fork Basin, Wyoming) concern the occurrence of a small cingular hypocone and a minute mesostyle on P4 (note that the mesostyle is absent on P4 of *A. atavus* from Bear Creek, Montana; see discussion in Yvy [1990][54]), an expanded posterior basin with a small isolated metaconule, no hypocone, and a crestiform metacone of M3, and a metaconid of m1 located far forward and near the lingual corner of the tooth, low and poorly individualized anterolophid, low metalophulid II, high and acute metaconid (higher than the protoconid), mesoconid separated from the hypoconid and protoconid by shallow valleys, transversal development of the hypoconulid and entoconid separated from the posterolophid by a slight groove. Considering these characters, we attribute the primitive ischyromyid from Albas to *Acritoparamys* aff.

atavus. This species differs from North American *A. atavus* in the presence of a metastylid and the lack of the mesial arm of the metalophid, which extends nearly the centre of the trigonid basin on m1-2 of *A. atavus*.

Subfamily indet.
?*Corbarimys* sp.
Fig.S2k-k'

Material.— UM-ALB-44, fragmentary M1or2 (left)
Discussion.— Although the enamel of this tooth is worn and damaged on the buccal margin, its dental pattern remains observable, except for the parastyle and mesostyle area, which is non visible (Fig.S2k-k'). This tooth is interpreted as an M1or2 of a very small ischyromyid (twice smaller than *Acritoparamys* aff. *atavus*). The late Paleocene/early Ypresian Microparamyini *Microparamys cheradius* from Cf-2 (Ivy 1990)[54] and '*Microparamys*' *nanus* from Dormaal (Smith 1999)[56] are also minute ischyromyids but they differ from UM-ALB-44 in having relatively smaller hypocone and metaconule. Among early ischyromyids, taxa with a minute size, prominent hypocone, and large metaconule (larger than paraconule) are very rare. To our knowledge, only *Corbarimys* and especially *Corbarimys hottingeri* from Fordones, Le Clot, and Rians (Marandat 1991[2], Marandat et al. 2012[13]) fits in size and morphology with the taxon from Albas. In addition to a similar minute size, a prominent hypocone and a large metaconule, they share a short labiolingual anteroloph, which is also a diagnostic character of *Corbarimys*. In addition to *C. hottingeri*, this genus is known from Silveirinha by *C. paisi* (a species larger than *C. hottingeri*) and possibly from North America by *Corbarimys*? *nomadus* from the Tuscahoma Formation, Mississippi, early Wasatchian (larger than other species of *Corbarimys*) (Escarguel 1999[57]; Beard and Dawson 2009[9]). A more complete representation is necessary to ensure an attribution to this genus.

Mammalia indet. 1
Fig.S2i

Material.— UM-ALB-26, lingual part of an upper molar (right)
Discussion.— This relative high-crowned fragmentary tooth has a suite of peculiar traits: pronounced bunodonty, smooth enamel, huge protocone with a marked development of its lingual slope, presence of a long postprotocingulum bearing a small hypocone, large paraconule and metaconule close to but isolated from the protocone, and absence of lingual cingulum (Fig.S2l). These characters, peculiarly the huge conules, the very unusual morphology of the protocone, and the high and long development of the postprotocingulum evoke the 'hyopsodontid condylarths' *Haplomylus* and *Utemylus* (e.g., Gingerich 1983[58]). Noteworthy, these genera differ from all 'hyopsodontids' (including the Thanetian/Ypresian European Louisininae) in having a developed postprotocingulum in place of a cingular hypocone. In size, UM-ALB26 is intermediate between *H. simpsoni* from Cf-2 and *H. zalmouti* from Wa-M (Rose 1981[11]; Gingerich and Smith 2006[8]). However, UM-ALB-26 differs from upper molars of *Haplomylus* and *Utemylus* in displaying an incipient hypocone on the postprotocingulum, a shorter mesial cingulum, and isolation of the conules. In *Haplomylus* and *Utemylus*, the preprotocrista and the endometaconulecrista connect to the paraconule and to the protocone, respectively. In UM-ALB-26, although these cristae are present, they are shorter and do not connect to the paraconule and protocone. UM-ALB-26 also differs from *Haplomylus* and *Utemylus* in the lack of postparaconulecrista and premetaconulecrista. More comprehensive material is needed to extend comparisons.

Mammalia indet. 2
Fig.S2l

Material.— UM-ALB-45, ?M3 (right)
Discussion.— This undetermined ?M3 represents the largest taxon in Albas; the tooth has a 'condylarth' (e.g., phenacodontids and mioclaenids) or plesiadapiform (e.g., plesiadapids) look, with low and bulbous cusps and conules, robust mesial and distal cingula, and no hypocone (Fig.S2i). Unfortunately, the tooth is very damaged so that precise comparisons are impossible.

Palynofacies Analysis

The composition of the organic matter is remarkably stable in the interval between the two isotopic excursions corresponding to the POE and PETM, as testified by the palynofacies study (Table S3). In total slides, amorphous organic matter (AOM) always predominates (88% to 92%) over opaque, translucent phytoclasts originating from terrestrial plant tissues and palynomorphs (pollen, spores and algae) (Fig.S4a). Amorphous organic matter is generally considered to originates from marine or lacustrine algal/bacterial sources, but can also derivates from degraded tissues of terrestrial plants (Tyson 1995[59]). The latter is most probably the case here, as (1) field data point to a terrestrial environment in this interval, and (2) no marine palynomorphs such as foraminifera linings or dinoflagellate cysts have been observed in the five samples (and ten slides) studied. In most sieved slides, opaques and translucent phytoclasts largely predominate, without, again, any marine palynomorphs having being observed (Fig.S4b). As a matter of fact, the sieving process often largely obliterates the organic amorphous matter component, allowing to better observe and identify the other organic particles, such as plant tissues debris, spores, pollen or algae, which are then concentrated. In our sample set, a strong terrestrial component (opaque and translucent plant fragments) and the absence of any marine palynomorphs strongly suggest an important (if not dominant) terrestrial organic component constituting the organic matter pool, in between the POE and the PETM isotopic excursions in Albas.

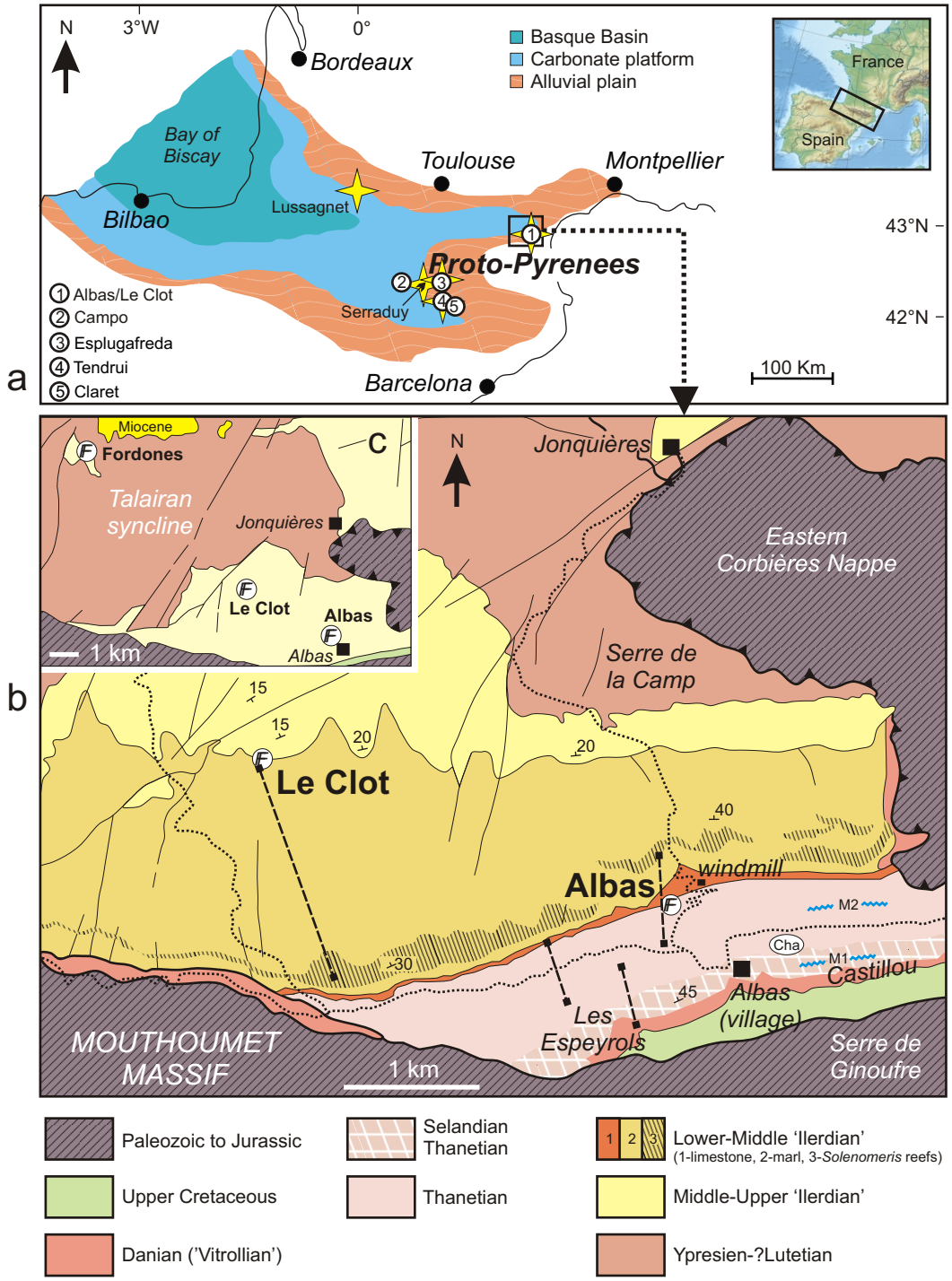

Fig. S1: Location of Albas, Le Clot, and Fordones mammal localities, Corbières area, Southern France. a, Paleogeography of the Pyrenean area near the Paleocene-Eocene boundary with the location of the French (Albas, Le Clot, and Fordones) and Spanish (Campo, Esplugafreda, Tendrui, and Claret) mammal localities. The yellow stars indicate sedimentary sections where the POE was recorded (see main text). **b**, Location of Albas and Le Clot on the geological map of the studied area, with location of the composite "Les Espeyrols/Le Clot" sedimentary section. **c**, Less detailed geological map showing the location of Fordones relative to Albas and Le Clot (post-Cretaceous to middle-upper 'Ilerdian' levels are here undifferentiated). Note that the Paleocene terrestrial series in the Corbières area is interrupted by two thin beds recording marine deposits. In the studied area, these two marine ingressions (noted M1 and M2) are visible east of the village of Albas. On the "Lairière" section (20 km west of Albas), the first marine ingression yielded the benthic foraminifer *Glomalveolina primaeva,* a biostratigraphic marker for the late Paleocene benthic foraminiferal zone SBZ3 (Selandian to Thanetian) (Massieux 1973)[60]. The second marine ingression, currently poorly constrained at Albas, has been interpreted to correlate with marine carbonates further west in the northern Pyrenean foreland basin, containing *Glomalveolina levis*, a biostratigraphic marker for the SBZ4 (late Thanetian) (Tambareau et al. 1995)[61]. Finally, below the second marine ingression and located east of the village of Albas (north of the *Castillou* hill, noted "Cha" on the figure), a continental layer yielded a late Paleocene (Thanetian) charophyte flora, composed by the species *Maedleriella michelina*, *Microchara vestita*, and *Sphaerochara edda* (Massieu et al. 1978, 1981)[62-63].

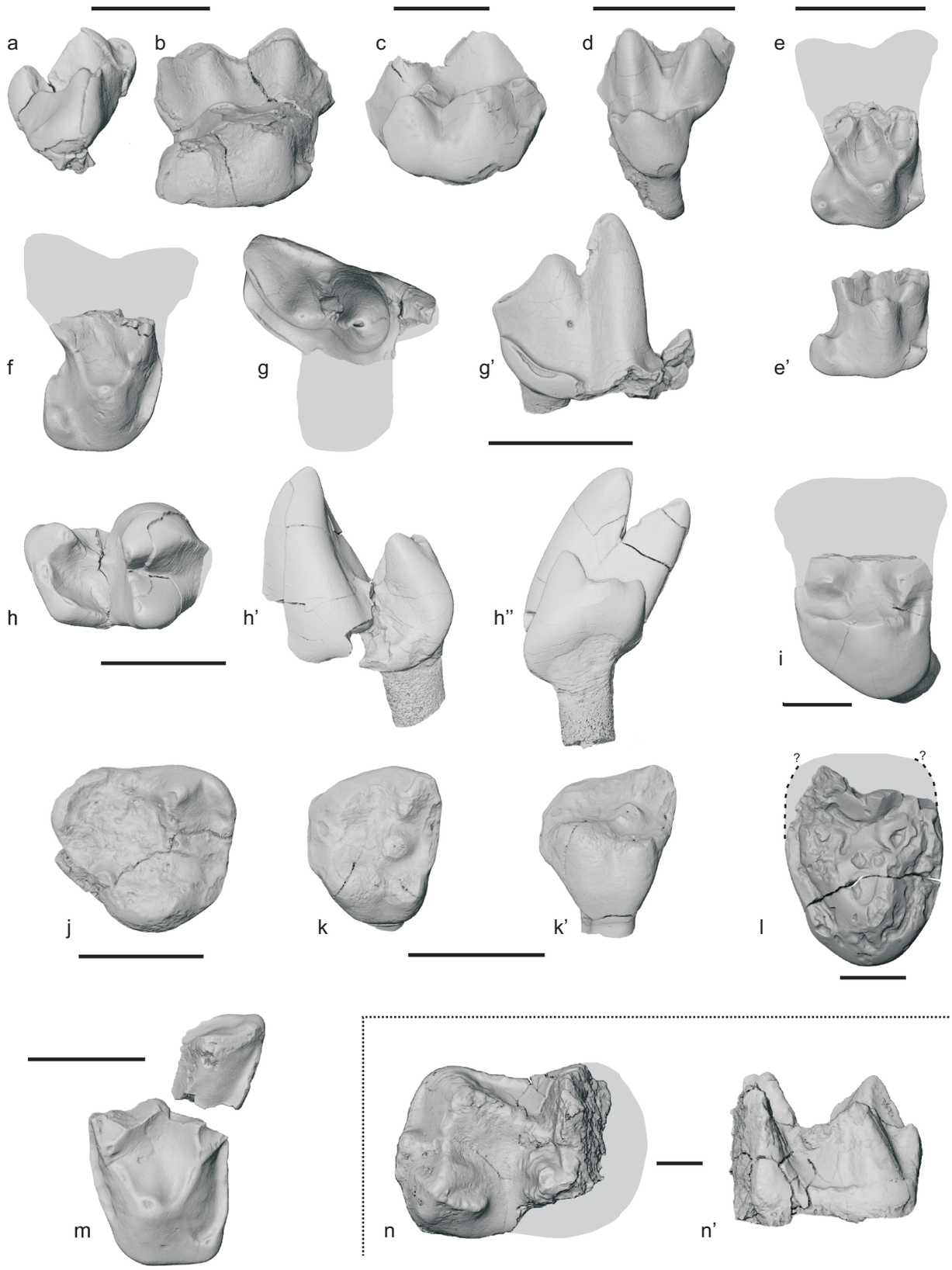

Fig. S2: Mammals from Albas and Fordones. a-b, *Paschatherium marianae*, **a**, right M3 UM-ALB-10 in lingual view; **b**, right M2 UM-ALB-33 in lingual view. **c**, *Teilhardimys* cf. *reisi*, right DP4 UM-ALB-28 in lingual view. **d**, *Bustylus* sp., left M1 UM-ALB-37 in lingual view. **e-e'**, cf. *Wyonycteris* sp., right M1or2 UM-ALB-19 in occlusal (e) and lingual (e') views. **f-g**, *Plagioctenodon* cf. *dormaalensis*, **f**, right M1or2 UM-ALB-16 in occlusal view; **g-g'**, right P4 UM-ALB-18 in occlusal (g) and labial (g') views. **h-h'',** Nyctitheriidae indet., left m1or2 UM-ALB-39 in occlusal (h), labial (h'), and mesial (h'') views. **i**, Mammalia indet. 1, lingual part of a right upper molar UM-ALB-26 in occlusal view. **j**, *Acritoparamys* aff. a*tavus*, right M3 UM-ALB-43 in occlusal view. **k-k'**, ?*Corbarimys* sp., left M1or2 UM-ALB-44 in occlusal (i) and lingual (i') views. **l**, Mammalia indet. 2, right ?M3 UM-ALB-45 in occlusal view. **m**, ?Adapisoriculidae gen. et sp. Indet., Left M1or2 UM-ALB-7 in occlusal view. **n-n'**, *Cymbalophus hookeri*, left m1 UM-FDN-290 in occlusal view (l) and labial (l') views. Incomplete teeth seen in occlusal view have their outlines tentatively completed. Scale bars: 1 mm.

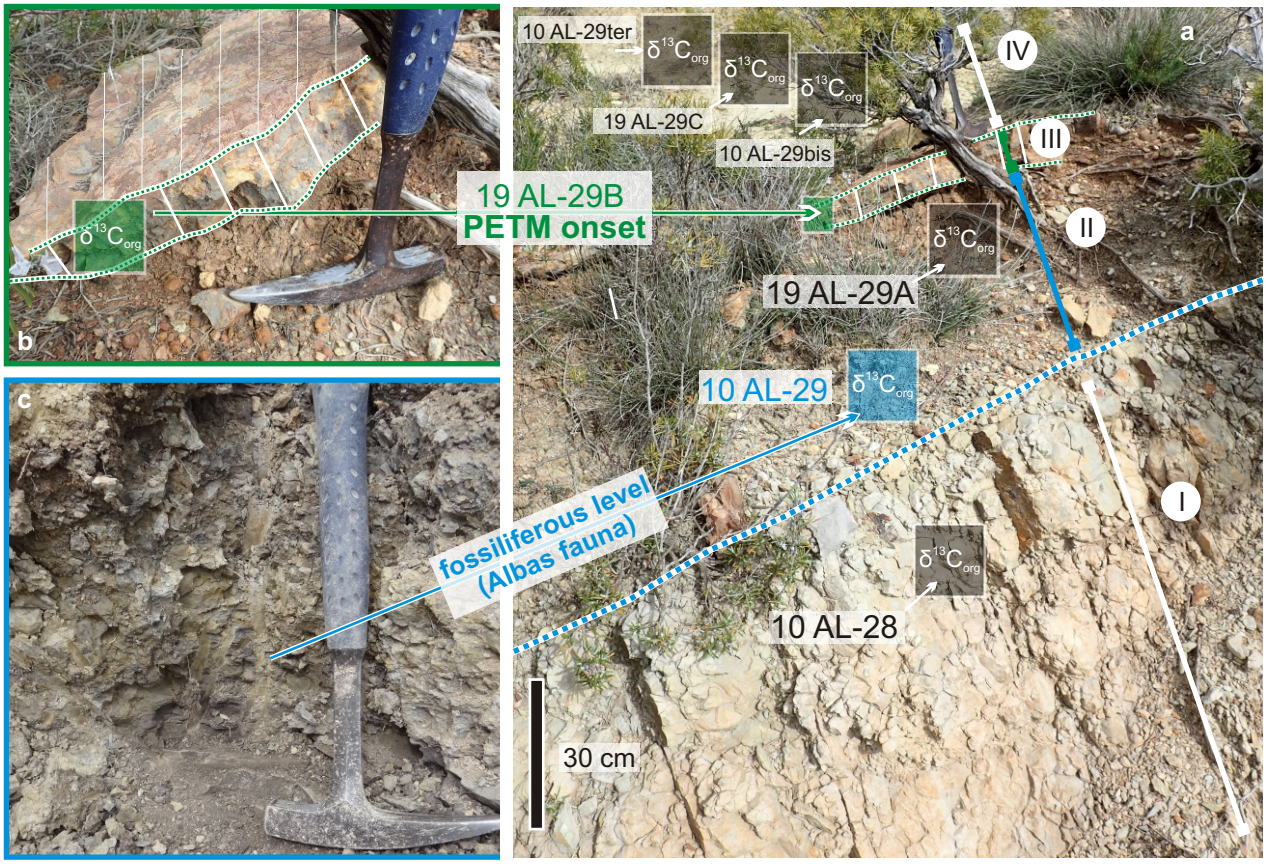

Fig. S3: Stratigraphic levels near the onset of the PETM ('Les Espeyrols/Le Clot' section, near the village of Albas). **a,** outcrop photography showing identities and positions of the chemostratigraphic samples and of the fossiliferous level of Albas before excavations in a sedimentary succession (comprising from base to top: I. yellow to ochre clayey fine sandstone; II. dark gray clay; III. gray limestone bed; IV. gray to purple silty clay; same color code used in Fig.1). **b,** Close-up of the limestone bed III, interpreted as having recorded the major basal inflection of the carbon isotope excursion marking the base of the onset of the PETM. **c,** Close-up of the latest Paleocene fossil mammal-bearing level of Albas (II) showing the gray color and clayed lithology.

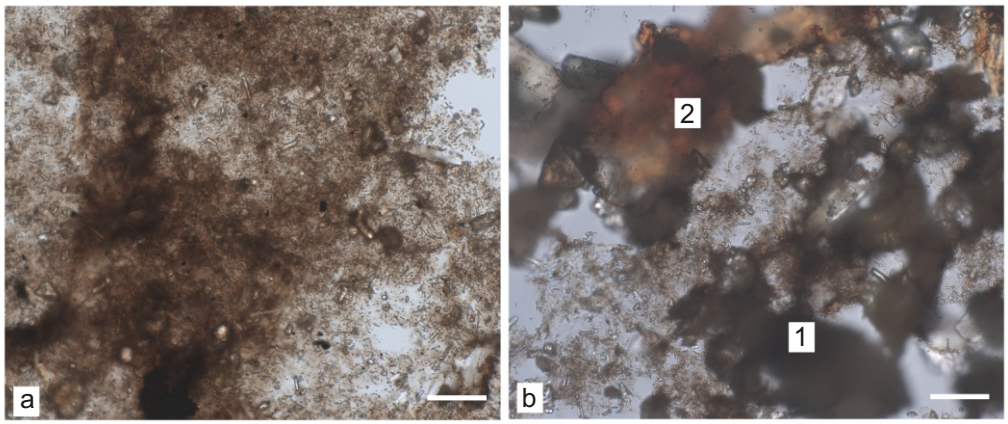

Fig. S4. Photomicrographs of the palynofacies from Albas, POE to PETM interval. **a,** sample 10AL30BIS, total slide. See the dominating amorphous organic matter, which appears as large, brown to grey fluffy clouds, representative of all the total slides from the five selected samples. **b,** sample 10AL36, filtered (10 µm) slide. See the dominating opaque phytoclasts debris (black particles, 1) and translucent phytoclasts debris (large orange-brown particle, 2). This palynofacies aspect is mostly representative of the sieved slides from the selected samples, showing little difference of the organic matter component in the POE-PETM interval at Albas. White scale bar=10 µm**.**

Table S1: Faunal list of Albas, Le Clot, and Fordones (number of specimens/species) (data compiled from Marandat 1991[2]; Marandat et al. 2012[13]; Hooker 2013[27]; Solé et al. 2015[64]; Boivin et al. 2018[65]; López-Torres and Silcox 2018[40]; Gernelle et al. 2024[66]; this study).

				Albas	Le Clot	Fordones
				n	n	n
Metatheria	**Marsupialiformes**	**Herpetotheriidae**	*Peratherium constans*		7	53
			Peratherium musivum		2	
			Peratherium sp.	3		
		Peradectidae	*Peradectes crocheti*			9
Allotheria	**Multituberculata**	**Neoplagiaulacidae**	?*Ectypodus riansensis*		4	
Eutheria	***incertae sedis***	**Adapisoriculidae**	*Bustylus* sp.	1		
		?Adapisoriculidae	gen. et sp. indet.	1		
		Pseudorhyncocyonidae	*Fordonia lavocati*			2
		?Pseudorhyncocyonidae	nov. gen. et sp.	1		
	Pantolesta	**Pantolestidae**	gen. et sp. indet.			2
	Eulipotyphla	**Nyctitheriidae**	*Plagioctenodon* cf. *dormaalensis*	4		
			?*Leptacodon* sp.		11	26
			Wyonycteris sp.	2		
			?Wyonycteris sp.			5
			gen. et sp. indet.	1		
	incertae sedis	**Louisinidae**	*Paschatherium marianae*	51		
			Paschatherium plaziati		36	260
			Paschatherium russelli			21
			Teilhardimys cf. *reisi*	2		
		Hyopsodontidae	*Lessnessina praecipuus*		3	
	Chiroptera	**"Eochiroptera"**	gen. et sp. indet. (div. sp.)		1	10
	Primates	**Paromomyidae**	*Arcius* cf. *rougieri*	1		
			Arcius rougieri			7
		Notharctidae	*Donrussellia magna*			7
			gen. et sp. indet.			1
	Perissodactyla	***incertae sedis***	*Cymbalophus hookeri*			1
	Artiodactyla	**Diacodexeidae**	*Diacodexis* aff. *antunesi*			11
	?Didelphodonta	**?Cimolestidae**	*Ilerdoryctes sigei*			2
	Apatotheria	**Apatemyidae**	cf. *Apatemys*			1
	Hyaenodonta	**Hyaenodontidae**	*Arfia* sp.	1		
			Parvagula palulae			1
	Rodentia	**Ischyromyidae**	*Acritoparamys* aff. *atavus*	3		
			gen. et sp. indet.	1		
		indet.	?*Corbarimys* sp.	1		
			Corbarimys hottingeri		54	127
			Corbarimys cezannei			8
	indet.	**indet.**	gen. et sp. indet. 1	1		
			gen. et sp. indet. 2	1		

Table S2: Carbon-isotopes $\delta^{13}C_{org}$ values, TOC and $CaCO_3$ contents on samples of the studied Albas 'Windmill' section, around the Paleocene-Eocene boundary. * n = 2; ** VPDB; n = 2

Section	Sample	Metering (m)	$CaCO_3$ (%)	TOC (%)*	$\delta^{13}C_{org}$ (‰)**
10AL	10AL-52	575.9	39.6	0.43	-23.4
10AL	10AL-50	573.2	82.3	1.36	-21.1
10AL	10AL-49 sup	572.7	67.4	0.81	-23.2
10AL	10AL-49	572.2	76.0	0.40	-23.0
10AL	10AL-48	570.4	85.7	0.84	-24.2
10AL	10AL-47	569.8	90.2	0.64	-21.7
10AL	10AL-46	568.8	88.9	0.20	-22.4
10AL	10AL-45	568.6	79.3	0.09	-23.0
10AL	10AL-44	568.4	32.5	0.07	-23.7
10AL	10AL-43	568.2	38.9	0.06	-23.9
10AL	10AL-42	567.9	32.0	0.06	-22.3
10AL	10AL-41	566.3	30.2	0.06	-23.6
10AL	10AL-40	564.7	45.6	0.06	-23.5
10AL	10AL-39	563.7	35.6	0.05	-23.3
12AL	12AL-08	561.7	38.3	0.05	-23.8
10AL	10AL-38	558.9	34.5	0.08	-23.5
12AL	12AL-07	556.7	43.4	0.10	-23.2
12AL	12AL-06	555.7	35.1	0.08	-23.9
10AL	10AL-37	552.7	88.2	0.13	-23.8
10AL	10AL-36	552.2	67.2	0.06	-25.2
10AL	10AL-35	551.5	61.0	0.06	-25.0
10AL	10AL-34	550.3	34.9	0.05	-23.2
12AL	12AL-10	550	81.4	0.15	-25.6
12AL	12AL-09	549.4	88.9	0.36	-25.3
10AL	10AL-33	549	29.0	0.08	-26.0
10AL	10AL-32	548.1	97.0	0.08	-24.4
19AL	19AL-31A	547.7	78.0	0.07	-23.2
10AL	10AL-31	547.5	69.7	0.06	-23.4
19AL	19AL30B	546.1	66.0	0.05	-22.9
12AL	12AL-05	545.5	30.3	0.02	-22.6
19AL	19AL-30A	544.9	42.0	0.04	-23.8
10AL	10AL-30ter	544.6	70.0	0.38	-23.1
10AL	10AL-30bis	543.3	79.4	0.05	-23.2
10AL	10AL-30	542.5	36.7	0.04	-22.8
19AL	19AL29D	541.6	30.0	0.05	-22.7
10AL	10AL-29ter	540.7	29.9	0.03	-23.9
19AL	19AL-29C	539.8	33.0	0.07	-23.7
10AL	10AL-29bis	538.7	31.8	0.08	-22.7
19AL	19AL-29B	537.8	68.0	0.05	-21.9
19AL	19AL-29A	537.7	50.0	0.06	-23.1
10AL	10AL-29	537.4	52.5	0.06	-22.1
10AL	10AL-28	537.2	61.0	0.03	-22.6
19AL	19AL27A	536.7	58.0	0.03	-22.7
10AL	10AL-27	536.3	39.6	0.03	-22.3
19AL	19AL-26B	535.2	40.0	0.05	-22.1
19AL	19AL-26A	534.5	37.0	0.06	-22.6
10AL	10AL-26	533.5	41.8	0.02	-22.2
19AL	19AL-25B	531.9	38.0	0.07	-21.9
19AL	19AL-25A	531.4	39.0	0.08	-22.6
10AL	10AL-24	529.7	38.2	0.05	-22.1
10AL	10AL-23	528.5	37.5	0.10	-24.1
10AL	10AL-21	525.5	27.5	0.16	-24.1
10AL	10AL-19	523.7	29.0	0.04	-23.7
10AL	10AL-17	520.2	33.9	0.08	-23.9
10AL	10AL-16	516.1	45.0	0.07	-22.4
10AL	10AL-14	511.2	41.8	0.05	-23.4
10AL	10AL-13	508.5	34.9	0.06	-22.6
10AL	10AL-10	502.5	34.8	0.10	-22.6

Table S3: Results from the counting of organic particles from palynofacies slides from Albas (POE to PETM interval). Palynofacies quantitative observations were performed using an Axioplan2 Imaging Zeiss microscope in transmitted light, both on slides obtained from total, non sieved residues and on slides obtained from sieved (10 µm) residues. Relative surface proportions of the various categories of organic particles were estimated using a square grid under the microscope. Note that all the total slides appear identical, showing that the amorphous organic matter component is largely dominating over opaque and translucent debris from plants and over palynomorphs. Similarly, the sieved slides also show one stable image, with opaque and translucent debris from plants largely dominating over the other organic components. Only the 10AL36 sample shows some amount of amorphous organic matter being preserved in the sieved slide. This appears when the amorphous organic matter is in slightly better preserved shape, allowing a part of it to resist the sieving process.

Samples	Slide type	AOM (%)	Opaque phytoclasts (%)	Translucent phytoclasts (%)	Pollen and spores and algae (%)	Resin (%)	Counted fields	Counted elementary squares filled with OM
10AL-40	Total slides	91	7	1	0	1	20	1065
10AL-40	Sieved slides (10µm)	0	99	1	0	0	35	311
10AL-36	Total slides	91	3	5	1	0	21	1764
10AL-36	Sieved slides (10µm)	71	20	7	1	1	20	980
10AL-33	Total slides	88	4	7	1	0	21	1419
10AL-33	Sieved slides (10µm)	0	59	40	1	0	23	380
10AL-30bis	Total slides	92	5	2	1	0	20	1727
10AL-30bis	Sieved slides (10µm)	0	94	3	2	1	20	339
10AL-19	Total slides	92	8	0	0	0	20	1211
10AL-19	Sieved slides (10µm)	0	99	0	1	0	22	330

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