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1 Chronological context, species occurrence, and environmental remarks on the Gelasian  
2 site Pedrera del Corral d'en Bruach (Barcelona, Spain) based on the small-mammal  
3 associations

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## 32 **Abstract**

33 Here we present the results of a study of the small-mammal assemblage recovered from  
34 a now-disappeared karstic fissure located in a quarry called “Pedrera del Corral d'en  
35 Bruach”. The site was located at 330 m a.s.l. in the Garraf Massif, ca. 20 km south of  
36 Barcelona. An archaeological rescue excavation was conducted in 2006 by the Grup de  
37 Recerca del Quaternari, focusing on sieving the sediments that had accumulated at the  
38 foot of the quarry face. Fortunately, some faunal remains and sediment were recovered,  
39 which were later processed and sorted. Two hundred and seventy small-mammal remains  
40 were identified at genus or species level, bringing to light great species richness (15 taxa).  
41 The assemblage is typical of the Mammal Neogene 17 (MN17) biozone, placing this site  
42 in the Gelasian stage of the Early Pleistocene. It is noteworthy that the first record of the  
43 glirid *Glirulus pusillus* in Iberia is documented. On the basis of the small mammals  
44 identified, the surrounding environment of the Garraf Massif is judged to have been  
45 characterized by open forest landscape and more humid environmental conditions than  
46 nowadays. Finally, the site provides a remarkable contribution to what is known of the  
47 Iberian small mammals of this time period.

48 **Keywords:** Early Pleistocene, Eulipotyphla, Chiroptera, Lagomorpha, Rodentia,  
49 Biochronology

## 50 **1. Introduction**

51  
52 The Gelasian (ca. 2.5 – 1.8 Ma) is the first stage of the Pleistocene epoch (Cohen et al.  
53 2020). This stage takes its name from the town of Gela in Sicily, which is near the Monte  
54 San Nicola section, where the stage was defined (Río et al. 1994). The base of the  
55 Gelasian stage coincides with Marine Isotope Stage 103 (MIS 103) and an increase in ice-  
56 rafted detritus in the ocean sediment of the Northern Hemisphere (Raymo et al. 1989).  
57 Furthermore, a series of changes in vegetation distribution patterns and migratory events  
58 among large-mammal continental faunas took place at this time (Zagwijn 1974; Lona  
59 1962; Lindsay et al. 1980; Azzaroli et al. 1988). It also coincides with the Gauss-  
60 Matuyama magnetic polarity boundary, which occurred ca. 2.58 Ma (Suc et al. 1997).  
61 This stage extends until ca. 1.8 Ma, more or less at the end of the Olduvai subchron,  
62 matching the upper part of the Gelasian with the boundary falls between the highest  
63 occurrence of *Discoaster brouweri* (below) and the lowest common occurrence of left-  
64 coiling *Neogloboquadrina pachyderma* (above), and below the lowest occurrences of  
65 medium-sized *Gephyrocapsa* (including *G. oceanica*) and *Globigerinoides tenellus*  
66 (Gibbard and Head Martin 2012). Despite what is known of the Gelasian stage, there are  
67 only a few sites in the Iberian Peninsula where the associated small-mammal fauna has  
68 been recovered. Among these palaeontological sites are El Rincón-1 (Alberdi et al. 1997)  
69 and Valdeganga 7 (Mein et al. 1978) in Albacete, Almenara-Casablanca-1 (Agustí et al.  
70 2011) and Alto de la Cerdaña (Guillem-Calatayud 2013) in Castellón, Tollo de Chiclana  
71 10 (Minwer-Barakat et al. 2004), Cortes de Baza- 1 (Peña 1975) and Galera G (Agustí et  
72 al. 2001) in Granada, Alozaina in Málaga (Aguilar et al. 1993), Villarroya in La Rioja  
73 (Laplana et al. 2016), and Islas Medes in Girona (Michaux 1971). This highlights the  
74 importance of “Pedrera del Corral d’en Bruach” in the context of the ancient Early  
75 Pleistocene, poorly represented in the Iberian Peninsula.

76 “Pedrera del Corral d’en Bruach” is a quarry situated 330 m a.s.l. in the Mesozoic Garraf  
77 Massif, which is dominated by calcareous and dolomitic outcrops, both from the Lower  
78 Cretaceous and the Jurassic (Fig. 1D-E). The site is located near the town of Gavà, ca. 20  
79 km south of Barcelona (Fig. 1A-C). The site was discovered, together with other fissures,  
80 by Joaquim Guillén, and these were published all together as Canal Negre 1 (Guillén  
81 2010). The washing-sifting of the sediments in the 2006 rescue excavation campaign  
82 (Fig. 1F-G), revealed a considerable amount of small-mammal remains (Daura et al.  
83 2007-2009). A first small-vertebrate identification was carried out and posted in the  
84 excavation field report (Daura et al. 2007-2009). Among the large mammals recovered,  
85 the presence of ursid, equid, rhinoceros, bovid and cercopithecine remains stands out. A  
86 preliminary chronological estimate based on this large-mammal assemblage placed the  
87 site within a range that could lie between MN16 and MN17 (ca. 2.5 Ma). In this context,  
88 the main objective of our small-mammal study is to undertake a chronological approach  
89 to the site and make some observations on the environment and the occurrence of species.

90

## 91 **2. Material and methods**

92 The small mammals of Pedrera del Corral d’en Bruach come from a now-disappeared  
93 karstic fissure. They were recovered during the rescue field campaign conducted in 2006

94 by means of the water-screening of 18 tons of sediment from the fissure in question. Three  
95 different meshes of 1.5, 0.8 and 0.5 mm were used for this procedure. The concentrated  
96 sediment was then thoroughly sorted at the “La Guixera Laboratory” (Castelldefels City  
97 Council) and the University of Barcelona (Daura et al. 2007-2009). The small-mammal  
98 remains mainly consist of disarticulated bones and teeth. The insectivore and bat remains  
99 are mainly composed of isolated teeth, fragmented mandibles, and humeri, whereas the  
100 lagomorph and rodent remains are mainly composed of isolated teeth. The nomenclature  
101 and measurements used for the identification of Soricidae follow Reumer (1984), and  
102 those used for Talpidae follow Hutchinson (1974), for bats Sevilla (1988), for lagomorphs  
103 Angelone (2005), for murids Pasquier (1974), for glirids Freudenthal (2004), for cricetids  
104 Cuenca-Bescós (2003), and for arvicolines Van der Meulen (1973).

105 Our study of the small-mammal remains revealed 270 remains, corresponding to 55  
106 individuals and comprising at least 15 species. Among these species, four insectivores  
107 (*Talpa cf. fossilis*, *Blarinoides mariae*, *Petenya hungarica* and *Deinsdorfia doukasi*), one  
108 bat (*Rhinolophus gr. ferrumequinum*), one lagomorph (*Prolagus cf. calpensis*), and ten  
109 rodents (*Glis minor*, *Eliomys intermedius*, *Glirulus cf. pusillus*, *Muscardinus cf.*  
110 *avellanarius*, *Apodemus atavus*, *Apodemus jeanteti*, *Castillomys rivas*, *Stephanomys*  
111 *balcellsi*, *Allocricetus* sp. and *Mimomys medasensis*) were identified (Table 1). The  
112 previous preliminarily identified species (Daura et al. 2007-2009) of insectivores  
113 (*Asoriculus gibberodon*), lagomorphs (*Prolagus michaux*, *P. ibericus* and *Trischizolagus*)  
114 and rodents (*Stephanomys minor*, *Apodemus gorafensis*, *A. mystacinus*, *Rhagapodemus*,  
115 *Castillomys gracilis*, *C. crusafonti*, *Mimomys stehlini*, *Kislangia* sp. and *Allophaiomys*  
116 sp.) were not recognized in the assemblage from Pedrera del Corral d'en Bruach.  
117 Therefore, the preliminary list should be discarded, considering as valid those identified  
118 in the present work.

119

### 120 **3. Systematic Paleontology**

121 Order EULIPOTYPHLA Waddell, Okada and Hasegawa, 1999

122 Family TALPIDAE Fischer, 1814

123 Genus *Talpa* Linnaeus, 1758

124 *Talpa cf. fossilis* Petényi, 1864

125 Figure 2A

126 *Material.* Three humeri (PCB-Ta-1 [w13= 3.87 mm], PCB-Ta-2 [w13= 3.42 mm], PCB-  
127 Ta-3 [w13= 3.51 mm]) (partially fragmented).

128 *Description.* The three elements recovered are poorly preserved, lacking all the important  
129 parts of their epiphyses, such as the head of the humeri, the entepicondyles and the  
130 ectepicondyles. The most important, clearly evident trait observed in these humeri is the  
131 short, wide diaphysis. The olecranon fossa is rather deep, and the trochlea is well  
132 delimited. The rest of the morphological characters are too weakly preserved to be  
133 described.

134 *Remarks.* The morphology of the humerus in burrowing moles is unequivocal. The  
135 extreme modifications of this element for efficient excavation result in many surfaces and  
136 muscular attachment points with no equivalent among other vertebrates. Sadly, the  
137 classification of the fossil burrowing talpids of Europe is unclear. Thousands of fossil  
138 humeri from Plio-Pleistocene moles are stored in collections in all the European  
139 institutions, tentatively labelled under several different names such as *Talpa minor*, *Talpa*  
140 *fossilis*, *Talpa europaea*, *Talpa gracilis*, *Talpa episcopalis* or *Talpa caeca*, awaiting  
141 definitive identification. Van Cleef-Roders and Van den Hoek Ostende (2001) revised the  
142 mandibles and dentition of two extant species of *Talpa*, later discussing the implications  
143 for the classification of the fossil elements of this genus. Unfortunately, their useful  
144 observations and comments were not pursued any further by other authors. Thus, the  
145 classification of fossil forms is still too weak and inconsistent to provide a solid specific  
146 identification here. The size and the morphology of the three elements found fit within  
147 the variation of *Talpa fossilis*, a species quite frequently cited within the specific literature  
148 of Plio-Pleistocene small mammals. We are aware that Van Cleef-Roders and Van den  
149 Hoek Ostende (2001) considered this form to be a likely junior synonym of *T. europaea*.  
150 However, Sansalone et al. (2015) found significant differences in size and shape of their  
151 corresponding humeri after a geometric morphometric analysis. In the light of this later  
152 study, we feel it prudent to ascribe tentatively the material from Pedrera del Corral to the  
153 fossil species.

154

155 Family SORICIDAE Fischer, 1817

156 Genus *Blarinoides* Sulimski, 1959

157 *Blarinoides mariae* Sulimski, 1959

158 Figure 2B

159 *Material.* One right m2 (PCB-BI-1) (L=2.20; TRW=1.34; TAW=1.39) in a fragmented  
160 hemimandible.

161 *Description.* The only tooth preserved is an m2. The tooth shows intense red pigmentation  
162 covering the upper half of the labial face. The protoconid is the highest cuspid. Paraconid,  
163 metaconid, entoconid and hypoconid are of similar height, all of them being lower than  
164 the protoconid. There is no clear entoconid cristid. In the fragmented hemimandible, the  
165 only useful character is the position of the mental foramen, which is placed between the  
166 anterior and the posterior alveoli of the m1.

167 *Remarks.* The occurrences of the genus *Blarinoides* in the Iberian Peninsula have been  
168 excellently analysed by Minwer-Barakat et al. (2007), who described *B. aliciae*, a new  
169 endemic species. This Spanish form of *Blarinoides* is clearly smaller than its European  
170 congeneric counterpart, *B. mariae*. The material from Pedrera del Corral d'en Bruach fits  
171 perfectly within the range of the latter species. The large size of the only m2 recovered  
172 precludes ascription to any other known Pliocene shrew, with the possible exception of  
173 *Beremendia fissidens*. However, the rather irregular morphology of the labial cingulid of  
174 the m2, the shape of the entoconid, and the alveoli of the m1 located more ventrally than  
175 the base of the m2, support ascription to *Blarinoides*. The known stratigraphic range for

176 *Blarinooides* covers the Pliocene and the Early Pleistocene of Europe (Reumer 1984;  
177 Rzebik-Kowalska 1998; Minwer-Barakat et al. 2007). However, according to the data  
178 compiled by Furió et al. (2018), its occurrence in the Iberian Peninsula seems to have  
179 been more short-lived, apparently constrained to the late Ruscinian (MN15) and the early  
180 Villanyian (MN16).

181 Genus *Petenya* Kormos, 1934

182 *Petenya hungarica* Kormos, 1934

183 Figure 2C

184 *Material.* One right m2 (PCB-Pe-1) (L=1.26; TRW=0.75; TAW=0.81) in a fragment of  
185 hemimandible.

186 *Description.* The upper zones on the labial side are distinctly covered with red  
187 pigmentation. The talonid is slightly longer than the trigonid. In occlusal view, the outline  
188 of the tooth is quadrangular. The base of the tooth is covered by a conspicuous cingulid,  
189 especially at its mesial, labial, and distal margins. There is a rather stout entoconid in an  
190 advanced position on the lingual side of the talonid.

191 *Remarks.* Although this is a rather frequent form in some European sites of Pliocene age,  
192 *Petenya hungarica* had only been reported in Spain three times before. Its occurrences  
193 at Moreda (MN16; Ruiz Bustos 2002), Tollo de Chiclana 13 (MN16; Minwer-Barakat et  
194 al. 2010) and Almenara-Casablanca 1 (MN17; Agustí et al. 2011) suggest that *P.*  
195 *hungarica* is a form indicative of Villanyian ages in the Iberian Peninsula.

196

197 Genus *Deinsdorfia* Heller, 1963

198 *Deinsdorfia doukasi* Furió and Mein, 2008

199 Figure 2D, 3A-B

200 *Material.* One right m1 (PCB-De-1) (L=1.50; TRW=0.74; TAW=0.81), one right m2  
201 (PCB-De-2) (L=1.37; TRW=0.74; TAW=0.74), one right m3 (PCB-De-3) (L=0.98;  
202 W=0.59), one right I1 (PCB-De-4), one left i1 (PCB-De-5) (broken).

203 *Description.* All the dental elements recovered from Pedrera del Corral d'en Bruach are  
204 stained with dark red pigmentation at the tips of their main cusps or cuspules. The most  
205 significant diagnostic traits are the asymmetric and tilted cuspules of the i1, the non-  
206 fissident I1 with an enlarged apex, the lower molars with rather short talonids and long  
207 paralophids (especially in m1), and the m3 with a single-cusped talonid.

208 *Remarks.* The genus *Deinsdorfia* is a typical element in the Pliocene and Early  
209 Pleistocene of Europe (Reumer 1984; Rzebik-Kowalska 1998). The Spanish finds of this  
210 genus were revised and described by Furió and Mein (2008), resulting in the description  
211 of an endemic Iberian species, namely *Deinsdorfia doukasi*. Nonetheless, the genus is  
212 hitherto poorly documented in Spain, probably because many authors working on  
213 Pliocene sites have confused its teeth with *Sorex* spp. remains. According to Furió et al.  
214 (2018), in Spain this species is indicative of a Villanyian age (MN16-MN17). However,

215 this rough guideline could change in the future, once some Ruscinian or Early Pleistocene  
216 sites have been revised.

217

218 Order CHIROPTERA Blumenbach, 1779

219 Family RHINOLOPHIDAE Gray, 1825

220 Genus *Rhinolophus* Lacépède, 1799

221 *Rhinolophus* gr. *ferrumequinum* (Schreber, 1774)

222 Figure 2E

223 *Material.* One left m1 (PCB-Rh-1) (L= 2.03 mm; W1=1.31 mm; W2=1.32 mm)

224 *Description.* The tooth recovered from Pedrera del Corral d'en Bruach shows in occlusal  
225 view the entoconid connected with the hypoconulid in the talonid part of the tooth and in  
226 labial view a cingulum that is thin and regular. These are characteristics of the genus  
227 *Rhinolophus*. The molar measurements lie within the size range of the extant *R.*  
228 *ferrumequinum* population, being larger than *R. mehelyi* (Sevilla 1988).

229 *Remarks.* There are two fossil species in the *R. ferrumequinum* group in Europe that are  
230 described in the Gelasian and Calabrian Early Pleistocene: *R. macrorhinus* and *R.*  
231 *postdelphinensis* (Topál 1979). Unfortunately, the diagnostic characters of these two  
232 species pertain to the upper dental series, so with only one lower molar we can neither  
233 rule out nor affirm that it is either of these species. In any case, in the Iberian Peninsula  
234 there are no records of these two species to date, although *R. ferrumequinum* has been  
235 identified in the Gelasian stage of Almenara-Casablanca 1 (Agustí et al. 2011). In light  
236 of these data, and given the lack of diagnostic material, our specimen has been assigned  
237 to the *R. ferrumequinum* group.

238

239 Order LAGOMORPHA Brandt, 1855

240 Family OCHOTONIDAE Thomas, 1897

241 Genus *Prolagus* Pomel, 1853

242 *Prolagus* cf. *calpensis* Major, 1905

243 Figure 2F

244 *Material.* One right p3 (PCB-Pr-1) (L=1.94 mm; W=1.57 mm)

245 *Description.* The only tooth recovered from Pedrera del Corral d'en Bruach pertaining to  
246 the family Ochotonidae is a third lower premolar. Morphologically, this presents in  
247 occlusal view a reduced entoconid, a “crochet” that is lost, and a thin protoconulid. These  
248 morphological characteristics are also described in the specimens of *P.* cf. *calpensis*  
249 recovered from the Gelasian sites of Almenara-Casablanca 1 (Gil and Sesé 1984), Moreda  
250 and Islas Medes (López-Martínez 1989), and Fonelas P1 (Laplana and Blain 2008). The

251 measurements of our tooth also coincide with those of the *P. cf. calpensis* specimens from  
252 the above-mentioned sites (Gil and Sesé 1984; López-Martínez 1989; Angelone 2005).

253 *Remarks.* Taking into account the sites referred to above together with El Rincón-1  
254 (Alberdi et al. 1997), the presence of *P. cf. calpensis* in the Iberian sites seems to be  
255 related with the Gelasian stage of the Early Pleistocene, lying within biozone MN17 and  
256 indicating a chronology between 2.6 and 1.8 Ma (Sesé 2006).

257

258 Order RODENTIA Bowdich, 1821

259 Family GLIRIDAE Muirhead, 1819

260 Genus *Glis* Brisson 1762

261 *Glis minor* Kowalski, 1956

262 Figure 4A–G

263 *Material.* One right p4 (PCB-Gm-5) and one left p4 (PCB-Gm-32), two right m1 (PCB-  
264 Gm-24; PCB-Gm-30), three left m1 (PCB-Gm-9; PCB-Gm-39; PCB-Gm-42), one left  
265 m2 (PCB-Gm-38), one right m3 (PCB-Gm-7), one left m3 (PCB-Gm-46), one left P4  
266 (PCB-Gm-3), two left M1 (PCB-Gm-47; PCB-Gm-14), one left M2 (PCB-Gm-30) and  
267 one left M3 (PCB-Gm-18)

268 *Description.* **p4:** The occlusal pattern is composed of 6 ridges: anterolophid, metalophid,  
269 centrolophid, mesolophid, posterotropid and posterolophid. In one specimen (PCB-Gm-  
270 5) a small anterotropid can be recognized (Fig. 4E). Anterolophid and protolophid are  
271 labially connected. The centrolophid is isolated. The posterolophid can be isolated or  
272 lingually connected to the mesolophid. The posterotropid remains isolated; **m1:** The  
273 occlusal pattern comprises 7 ridges: anterolophid, anterotropid, metalophid, centrolophid,  
274 mesolophid, posterotropid and posterolophid. Anterolophid, anterotropid and metalophid  
275 are lingually connected, although in one case the anterotropid remains isolated.  
276 Centrolophid and metalophid are isolated. The posterolophid is connected lingually to the  
277 posterotropid, although in two cases this ridge remains isolated; **m2:** The occlusal pattern  
278 comprises 7 ridges. The anterolophid can be isolated or lingually connected to the  
279 metalophid. The anterotropid remains. Centrolophid and mesolophid are isolated. The  
280 posterotropid remains isolated; **m3:** As in the other lower molars, the occlusal pattern  
281 comprises 7 ridges. The anterolophid is lingually connected to the metalophid. The  
282 anterotropid can also be lingually connected to the anterolophid or remain isolated. The  
283 centrolophid and mesolophid are isolated. Posterolophid and posterotropid are lingually  
284 connected; **P4:** The occlusal pattern is composed of 6 main ridges: anteroloph, protoloph,  
285 centroloph, metaloph, posterotrope and posteroloph. A tiny anterotrope can also be  
286 distinguished. The centroloph is discontinuous and does not reach the labial wall of the  
287 teeth. Centroloph and posterotrope are labially connected. The metaloph is also  
288 discontinuous. The posterotrope is labially connected to the posteroloph; **M1:** The  
289 occlusal pattern is composed of 7 ridges: anteroloph, anterotrope, protoloph, centroloph,  
290 metaloph, posterotrope and posteroloph. All the ridges are isolated, with the exception of  
291 the posterotrope and posteroloph, which are labially connected; **M2:** The pattern is the  
292 same as in the M1. However, the posterotrope can reach the posteroloph; **M3:** The



293 occlusal pattern is composed of 7 main ridges.. All of these are lingually connected by a  
294 continuous endoloph. Anteroloph, protoloph and centroloph are also labially connected,  
295 though not fused. Metaloph and posteroloph are labially fused.

296 *Remarks.* Our specimens (Table 2) coincide with the measurements of *G. minor* from  
297 central Europe (e.g. Striczky and Pazonyi 2014). *Glis minor* is a species described on the  
298 basis of Pliocene material from Podlesice (Poland) by Kowalski (1959). This species is  
299 well documented in the Early Pleistocene (Gelasian and Calabrian stages) in central and  
300 southern Europe, at sites such as Osztramos 7 (Janossy 1986), Rivoli Veronese (Berto et  
301 al. 2022), Le Vallonnet (Lumley et al. 1988), Betfia 13 (Terzea 1996) and Les Valerots  
302 (Bonifay 1973), but until now there has been no known reference to the species in the  
303 Iberian Peninsula. Thus, the presence of *G. minor* in Pedrera del Corral d'en Bruach  
304 constitutes the first record of the species known to date in Iberia.

305

306 Genus *Eliomys* Wagner, 1849

307 *Eliomys intermedius* Friant, 1953

308 Figure 4H–K

309 *Material.* One right m2 (PCB-Ein-22), one right P4 (PCB-Ein-43), one right M1-M2  
310 (PCB-Ein-11), two left M1-M2 (PCB-Ein-1; PCB-Ein-13), one right M3 (PCB-Ein-14),  
311 four left M3 (PCB-Ein-17; PCB-Ein-30; PCB-Ein-29; PCB-Ein-19).

312 *Description.* **m2:** The occlusal pattern is composed of 5 ridges: anterolophid, metalophid,  
313 centrolophid, mesolophid and posterolophid. The anterolophid and the centrolophid are  
314 lingually connected. The metalophid is isolated. Mesolophid and posterolophid are also  
315 lingually fused and with an accessory crest between them; **P4:** A small anteroloph is  
316 present on the labial side of the anterior wall of the tooth. Paracone and metacone are  
317 well-individualized cusps. The centroloph is reduced to a number of cuspules between  
318 the protoloph and the metaloph. The posteroloph is long. Protoloph, metaloph, and  
319 posteroloph are lingually connected by a continuous endoloph; **M1-M2:** There are four  
320 main ridges: anteroloph, protoloph, metaloph and anteroloph, all of them lingually  
321 connected by a continuous endoloph. Paracone and metacone are well marked.  
322 Precentroloph and postcentroloph are present in one tooth, being lingually connected. In  
323 the other two the postcentroloph is lacking, and only a short, isolated precentroloph is  
324 present; **M3:** This is trapezoidal in shape. As in the case of the other upper molars, the  
325 occlusal pattern is composed of 4 main ridges, all of them lingually connected by a  
326 continuous endoloph. The anteroloph is the longest ridge, whereas the posteroloph is the  
327 shortest. Paracone and metacone are not detached from protoloph and metaloph,  
328 respectively. A short precentroloph is present in three teeth, whereas a short  
329 postcentroloph is present in only one tooth. Both precentroloph and postcentroloph are  
330 connected labially to the protoloph and the metaloph. All the morphological and metric  
331 (Table 3) characters identified in our specimens coincide with the description provided  
332 for *Eliomys intermedius* by García-Alix et al. (2008a).

333 *Remarks.* The first mentions of *E. intermedius* in the Iberian Peninsula are from Early  
334 Pliocene (MN14) sites located in the Teruel Basin, the Cabriel and Alcoy Basins, and the  
335 Granada and Guadix Basins (e.g. Masino et al. 2015). The species just reaches the Late

336 Pliocene (MN16) in sites such as Tollo Chiclana 3 and Almenara-Casablanca 4 (Agustí et  
337 al. 2011) and the Early Pleistocene (Calabrian age) in the Sierra de Quibas (Montoya et  
338 al. 2001), where it coexists with the current species *E. quercinus* (Piñero et al. 2015).

339

340 Genus *Glirulus* Thomas, 1906

341 *Glirulus* cf. *pusillus* (Heller, 1936)

342 Figure 4M

343 *Material*. One right m2 (PCB-Gpu-23) (L=0.99 mm; W=0.86 mm)

344 *Description*. The occlusal pattern is composed of 7 main ridges: anterolophid,  
345 anterotropid, metalophid, centrolophid, mesolophid, posterotropid and posterolophid. A  
346 small extra ridge is present between anterotropid and metalophid. In addition, two long  
347 extra ridges are located on the two sides of the centrolophid. Anterolophid, metalophid,  
348 centrolophid, mesolophid and posterolophid are lingually connected by a continuous  
349 endolophid. The labial ends of the metalophid, mesolophid and posterolophid are  
350 projected forwards. All these morphological characteristics are described in the species  
351 *Glirulus pusillus* identified in central Europe (Van den Hoek-Oestende 2003). The  
352 measurements of our specimens also coincide with those of the central European  
353 specimens belonging to *G. pusillus* (Van den Hoek-Oestende 2003). Despite these factors,  
354 due to the scarcity of the identified material, we have decided to assign our specimens to  
355 *G. cf. pusillus*.

356 *Remarks*. *G. pusillus* is a rare component of Late Pliocene and Early Pleistocene faunas  
357 in Europe (Nadachowski and Daoud 1995). *G. pusillus* specimens from the Late Pliocene  
358 and Early Pleistocene differ only in size from the extant species, *G. japonicus* (which  
359 currently only inhabits Japan), since the teeth of the current species are larger than those  
360 of *G. pusillus*. Pedrera del Corral d'en Bruach is the first finding of *G. pusillus* in the  
361 Iberian Peninsula.

362 Genus *Muscardinus* Kaup, 1829

363 *Muscardinus* cf. *avellanarius* (Lianneus, 1758)

364 Figure 4L

365 *Material*. One right m1 (PCB-Mu-35) (L=1.61 mm; W=1.35 mm)

366 *Description*. The tooth presents a subrectangular occlusal surface, with the posterior part  
367 of the molar wider than the front part. In occlusal view, it presents 6 ridges: anterolophid,  
368 anterotropid, metalophid, centrolophid, mesolophid and posterlophid. All of these are  
369 isolated, with the exception of the anterolophid and the anterotropid, which are labially  
370 and lingually fused. The above-mentioned morphological characters could be assigned to  
371 the two Early Pleistocene *Muscardinus* species present in the Iberian Peninsula, *M.*  
372 *pliocaenicus* and *M. avellanarius* (García-Alix et al. 2008b). According to Nadachowski  
373 and Daoud (1995), the increase in size of the molars from *M. pliocaenicus* to *M.*  
374 *avellanarius* could be a diagnostic feature separating the two species. Our single  
375 specimen presents a length and width that lie within the measurement parameters of *M.*

376 *avellanarius*. It contrasts, for example, with the species identified in Somssich Hill 2 in  
377 Hungary by Striczky and Pazonyi (2014) and Tegelen in the Netherlands by Van den Hoek  
378 Ostende (2003), being larger than the specimens of *M. pliocaenicus* identified in these  
379 deposits. Despite this and due to the scarcity of the identified material, we have decided  
380 to assign our specimen to *M. cf. avellanarius*.

381 *Remarks.* According to García-Alix et al. (2008b), *M. pliocaenicus* and *M. avellanarius*  
382 belong to the same lineage, and although these species are well documented in central  
383 Europe (e.g. Nadachowski and Daoud 1995; Van den Hoek Ostende 2003; Striczky and  
384 Pazonyi 2014) during the end of the Pliocene and the Early Pleistocene, the tooth in  
385 Pedrera del Corral d'en Bruach is confirmed as belonging to MN17 by the result of the  
386 small-mammal association as a whole. This could be the oldest citation known to date of  
387 the species *M. avellanarius* in the Iberian Peninsula.

388

389 Family MURIDAE Illiger, 1811

390 Genus *Apodemus* Kaup, 1826

391 *Description.* Pedrera del Corral d'en Bruach has yielded 198 teeth displaying the common  
392 features of the genus *Apodemus*: the presence of t7 and the t6-t9 connection in the M1  
393 and M2, and a well-developed labial cingulum and the absence of a longitudinal crest in  
394 the m1 and m2.

395

396 *Apodemus atavus* Heller, 1936

397 Figure 5A–L

398 *Material.* 12 left M1 (PCB-Aat-1, PCB-Aat-4, PCB-Aat-6, PCB-Aat-7, PCB-Aat-11,  
399 PCB-Aat-12, PCB-Aat-13, PCB-Aat-14, PCB-Aat-22, PCB-Aat-25, PCB-Aat-26, PCB-  
400 Aat-28), 19 right M1 (PCB-Aat-2, PCB-Aat-3, PCB-Aat-5, PCB-Aat-8, PCB-Aat-9,  
401 PCB-Aat-10, PCB-Aat-15, PCB-Aat-16, PCB-Aat-17, PCB-Aat-18, PCB-Aat-19, PCB-  
402 Aat-20, PCB-Aat-21, PCB-Aat-23, PCB-Aat-24, PCB-Aat-27, PCB-Aat-29, PCB-Aat-  
403 30, PCB-Aat-31), 14 left M2 (PCB-Aat-32, PCB-Aat-33, PCB-Aat-35, PCB-Aat-36,  
404 PCB-Aat-39, PCB-Aat-42, PCB-Aat-44, PCB-Aat-45, PCB-Aat-46, PCB-Aat-47, PCB-  
405 Aat-48, PCB-Aat-49, PCB-Aat-50, PCB-Aat-51), six right M2 (PCB-Aat-34, PCB-Aat-  
406 37, PCB-Aat-38, PCB-Aat-40, PCB-Aat-41, PCB-Aat-43), four left M3 (PCB-Aat-52,  
407 PCB-Aat-53, PCB-Aat-57, PCB-Aat-58), three right M3 (PCB-Aat-54, PCB-Aat-55,  
408 PCB-Aat-56), 16 left m1 (PCB-Aat-59, PCB-Aat-62, PCB-Aat-63, PCB-Aat-65, PCB-  
409 Aat-66, PCB-Aat-69, PCB-Aat-71, PCB-Aat-73, PCB-Aat-76, PCB-Aat-80, PCB-Aat-  
410 83, PCB-Aat-84, PCB-Aat-85, PCB-Aat-86, PCB-Aat-87, PCB-Aat-88), 14 right m1  
411 (PCB-Aat-60, PCB-Aat-61, PCB-Aat-64, PCB-Aat-67, PCB-Aat-68, PCB-Aat-70, PCB-  
412 Aat-72, PCB-Aat-74, PCB-Aat-75, PCB-Aat-77, PCB-Aat-78, PCB-Aat-79, PCB-Aat-  
413 81, PCB-Aat-82), 13 left m2 (PCB-Aat-90, PCB-Aat-91, PCB-Aat-93, PCB-Aat-97,  
414 PCB-Aat-100, PCB-Aat-102, PCB-Aat-103, PCB-Aat-107, PCB-Aat-110, PCB-Aat-  
415 113, PCB-Aat-115, PCB-Aat-116, PCB-Aat-118), 17 right m2 (PCB-Aat-89, PCB-Aat-  
416 92, PCB-Aat-94, PCB-Aat-95, PCB-Aat-96, PCB-Aat-98, PCB-Aat-99, PCB-Aat-101,  
417 PCB-Aat-104, PCB-Aat-105, PCB-Aat-106, PCB-Aat-108, PCB-Aat-109, PCB-Aat-  
418 111, PCB-Aat-112, PCB-Aat-114, PCB-Aat-117), six left m3 (PCB-Aat-119, PCB-Aat-

419 120, PCB-Aat-124, PCB-Aat-126, PCB-Aat-127, PCB-Aat-128), four right m3 (PCB-  
420 Aat-121, PCB-Aat-122, PCB-Aat-123, PCB-Aat-125).

421 *Description.* The sample from Pedrera del Corral d'en Bruach includes 128 specimens of  
422 a small-sized *Apodemus* species. The teeth show the typical traits of *Apodemus atavus*  
423 (see Heller 1936): small size, the protoconid-metaconid pair connected to the lingual lobe  
424 of the anteroconid, and the presence of accessory labial cuspids, a well-developed tma  
425 and the presence of a small root, between the proximal and distal roots in some specimens  
426 on the m1, a large posterior heel on m2 protruding beyond the outline, and a frequent  
427 deep separation between the t4 and the t7 on the M1 and M2. The t12 is well developed,  
428 and the t6 is joined to, or in contact with, the t9 in both the M1 and M2. Although  
429 Rietschel and Storch (1974) proposed the presence of a large posterior accessory cuspid  
430 (c1) as a diagnostic criterion of *Apodemus atavus*, Martín-Suárez and Mein (2004) ruled  
431 this out as a diagnostic feature when they observed that the c1 is highly variable in size  
432 among the m2s of this species from the localities of Schernfeld (Germany) and Balaruc 2  
433 (France). We can corroborate this high variability: some specimens from Pedrera del  
434 Corral d'en Bruach show a large c1 (33%), whereas in other specimens it can be small or  
435 barely visible. It is even absent in five out of 30 cases. The size of the studied material  
436 (Table 4) is very similar to that of the samples of *Apodemus atavus* from Tollo de  
437 Chiclana 3 and 13 (Spain; Minwer-Barakat et al. 2005), Cañada del Castaño 1 (Spain;  
438 Martín-Suárez 1988), Rambla Seca-A, Belmez-1 (Spain; Castillo Ruiz 1990), Alosaina  
439 (Spain; Aguilar et al. 1993a), Calicasas 3 and 3B (Spain; García-Alix et al. 2008c),  
440 Schernfeld (Germany; Pasquier 1974), Hambach (Germany; Mörs et al. 1998), Balaruc  
441 6, Lo Fournas 4, Mas Rambault 2 (France; Bachelet 1990), Grand Serre (France; Aguilar  
442 et al. 1993b), Monte Peglia (Italy; Meulen 1973), Monte la Mesa (Italy; Marchetti et al.  
443 2000), and Notio 1 (Greece; Hordijk and de Bruijn 2009), among other sites. In  
444 accordance with both morphological and biometric criteria, therefore, the studied molars  
445 are assigned to *Apodemus atavus*.

446 *Remarks.* Several authors have considered *Apodemus atavus* and *Apodemus dominans* to  
447 be extreme phenotypes of a single species, *A. dominans* being a junior synonym of *A.*  
448 *atavus* (Fejfar and Storch 1990; Martín-Suárez and Mein 2004; Minwer-Barakat et al.  
449 2005; García-Alix et al. 2008c; Colombero et al. 2014). The wide geographic distribution  
450 of *Apodemus atavus* includes much of the Palearctic region, the species having been  
451 recorded from Western Europe through Georgia to China (Cai and Qiu 1993; Martín-  
452 Suárez and Mein 2004; Knitlová and Horáček 2017; Agustí et al. 2022). The time range  
453 of this species extends from the latest Miocene to the Early Pleistocene (Rietschel and  
454 Storch 1974; Fejfar and Storch 1990; Minwer-Barakat et al. 2005; Sala and Masini 2007;  
455 García-Alix et al. 2008c; Colombero et al. 2014). The tooth morphology of *Apodemus*  
456 *atavus* is relatively conservative, with little variation between the oldest and the youngest  
457 populations (Martín-Suárez and Mein 2004; Minwer-Barakat et al. 2005). *Apodemus*  
458 *atavus* is considered by some authors to be a direct ancestor of the extant *Apodemus*  
459 *sylvaticus* (Rietschel and Storch 1974; Fejfar and Storch 1990; Martín-Suárez and Mein  
460 1998; Piñero et al. 2022).

461  
462 *Apodemus jeanteti* Michaux, 1967

463 Figure 5M–Y

464 *Material.* Eight left M1 (PCB-Aje-38, PCB-Aje-40, PCB-Aje-41, PCB-Aje-44, PCB-  
465 Aje-45, PCB-Aje-49, PCB-Aje-51, PCB-Aje-52), nine right M1 (PCB-Aje-37, PCB-Aje-

466 39, PCB-Aje-42, PCB-Aje-43, PCB-Aje-46, PCB-Aje-47, PCB-Aje-48, PCB-Aje-50,  
467 PCB-Aje-53), seven right M2 (PCB-Aje-54, PCB-Aje-57, PCB-Aje-59, PCB-Aje-61,  
468 PCB-Aje-62, PCB-Aje-64, PCB-Aje-66), six left M2 (PCB-Aje-55, PCB-Aje-56, PCB-  
469 Aje-58, PCB-Aje-60, PCB-Aje-63, PCB-Aje-65), one right M3 (PCB-Aje-68), three left  
470 M3 (PCB-Aje-67, PCB-Aje-69, PCB-Aje-70), six right m1 (PCB-Aje-1, PCB-Aje-8,  
471 PCB-Aje-9, PCB-Aje-12, PCB-Aje-14, PCB-Aje-15), nine left m1 (PCB-Aje-2, PCB-  
472 Aje-3, PCB-Aje-4, PCB-Aje-5, PCB-Aje-6, PCB-Aje-7, PCB-Aje-10, PCB-Aje-11,  
473 PCB-Aje-13), nine right m2 (PCB-Aje-17, PCB-Aje-18, PCB-Aje-19, PCB-Aje-20,  
474 PCB-Aje-21, PCB-Aje-22, PCB-Aje-23, PCB-Aje-25, PCB-Aje-28), five left m2 (PCB-  
475 Aje-16, PCB-Aje-24, PCB-Aje-26, PCB-Aje-27, PCB-Aje-29), five right m3 (PCB-Aje-  
476 30, PCB-Aje-31, PCB-Aje-32, PCB-Aje-34, PCB-Aje-35), two left m3 (PCB-Aje-33,  
477 PCB-Aje-36).

478 *Description.* The sample from Pedrera del Corral d'en Bruach includes 65 specimens of a  
479 large-sized *Apodemus* species. The crown of these molars is higher than that of other  
480 *Apodemus* species, which may lead to this sample being confused with *Rhagapodemus*.  
481 However, the absence of tma in the studied m1 rules this option out in favour of the  
482 species *Apodemus jeanteti*. The m1 and m2 have a well-developed labial cingulum with  
483 high accessory labial cuspids. In the m1, the round or oval posterior heel is somewhat  
484 smaller than in the m2. The m2 has a large labial anteroconid, whereas this is small or  
485 absent in the m3. In the M1, the t1, t2 and t3 are almost aligned. The t12 is of medium  
486 size in the M1 and small or absent in the M2. Overall, the t4 and t7 are separated, whereas  
487 the t6 and t9 are connected in both the M1 and M2. In the M1, there is a posterior spur on  
488 the t3, but this is absent on the t1 (except for PCB-Aje-39 and PCB-Aje-51), this latter  
489 cusp being isolated in seven out of 15 cases. In the M2, the t9 is present in all but two  
490 specimens, and the t1 and t3 are isolated. The t3 is absent in the M3. All these  
491 morphological features are characteristic of *Apodemus jeanteti* (see Michaux 1967;  
492 Pasquier 1974). The size of the specimens from Pedrera del Corral d'en Bruach (Table 5)  
493 is close to that of *Apodemus gorafensis*. Nevertheless, the studied teeth can undoubtedly  
494 be attributed to *Apodemus jeanteti* given the absence of tma in the m1. In addition, this  
495 material coincides with the size of *Apodemus jeanteti* from its type locality Seynes,  
496 France (Michaux 1967; Pasquier 1974), although the latter has somewhat higher mean  
497 values. Similarly, the specimens from Pedrera del Corral d'en Bruach are close in size to  
498 *Apodemus jeanteti* from Mont-Helene, Lo Fournas 13, Pla de la Ville, Nimes, Seynes,  
499 Grand Serre, Mas Rambault 2 (southern France; Bachelet 1990; Pasquier 1974; Aguilar  
500 et al. 2002), Moreda 1A and 1B, Belmez-1 and Alozaina (southern Spain; Castillo Ruiz  
501 1990; Aguilar et al. 1993a).

502 *Remarks.* *Apodemus jeanteti* probably evolved from *Apodemus gorafensis* during the late  
503 Ruscinian (MN15) (Martín-Suárez and Mein 1998). In the Early Pliocene, *Apodemus*  
504 *gorafensis* also gave rise to *Apodemus agustii*, a species only recorded at its type locality,  
505 Cañada del Castaño, Spain (Martín Suárez 1988). *Apodemus jeanteti* has been found in  
506 both Spain and southern France (Pasquier 1974; Gil and Sesé 1985; Adrover 1986;  
507 Bachelet 1990; Castillo Ruiz 1990; Aguilar et al. 1993a, 1993b, 2002). Its temporal  
508 distribution extends as far as the Early Pleistocene, the species probably becoming extinct  
509 before the onset of the Olduvai subchron (1.94–1.78 Ma). *Apodemus jeanteti* and  
510 *Apodemus atavus* were replaced by *Apodemus mystacinus*, *Apodemus sylvaticus* and  
511 *Apodemus flavicollis* in southern Europe in the course of the Early Pleistocene (Michaux  
512 and Pasquier 1974; Martín-Suárez and Mein 1998; Piñero et al. 2022).

513

514 Genus *Castillomys* Michaux, 1969

515 *Castillomys rivas* Martín-Suárez and Mein, 1991

516 Figure 6A–G

517 *Material.* One right M2 (PCB-Cri-1), one left M2 (PCB-Cri-2), two left m1 (PCB-Cri-3,  
518 PCB-Cri-4), two right m2 (PCB-Cri-5, PCB-Cri-7), one left m2 (PCB-Cri-6), one left m3  
519 (PCB-Cri-8).

520 *Description.* The genus *Castillomys* is represented at Pedrera del Corral d'en Bruach by  
521 only eight specimens. The small size, the absence of t7 and the development of a posterior  
522 crest on the t1 in the M2, and the well-developed longitudinal crest on the m1 are  
523 distinctive features of *Castillomys*. All the specimens have well-developed longitudinal  
524 crests, completing the connection among the tubercles of the crown. The m1 and m2 have  
525 a broad labial cingulum separated from the protoconid by a valley. These morphological  
526 characters are present in the species *Castillomys rivas*. Moreover, these molars agree in  
527 size (Table 6) with *Castillomys rivas* from Loma Quemada-1, its type locality (Spain;  
528 Martín-Suárez and Mein 1991), as well as with *Castillomys rivas* from Quibas (Piñero et  
529 al. 2015, 2022), Valdeganga 7 (Martín-Suárez and Mein 1991), Venta Micena 1, Orce 7  
530 (Martín-Suárez 1988), Huétor Tájar 1 and 8 (García-Alix et al. 2009), and Tollo de  
531 Chiclana 10B (Minwer-Barakat et al. 2005), among other sites. The studied specimens  
532 can be distinguished from *Castillomys gracilis* and *Castillomys crusafonti* by their larger  
533 size and the greater development of the longitudinal connections (Michaux 1969; Martín-  
534 Suárez and Mein 1991).

535 *Remarks.* The first occurrence of *Castillomys* apparently coincides with the onset of the  
536 Pliocene (van de Weerd 1976; Mein et al. 1990; Piñero and Agustí 2019; Piñero et al.  
537 2018), whereas it became extinct at the Early-Middle Pleistocene boundary (Agustí et al.  
538 1999). Martín-Suárez and Mein (1991) proposed the phyletic lineage *Castillomys gracilis*  
539 – *Castillomys crusafonti* – *Castillomys rivas*, which underwent an increase in size and  
540 greater development of the longitudinal connections over the course of the Pliocene and  
541 Early Pleistocene. *Castillomys rivas* has been identified in a number of Early Pleistocene  
542 Spanish and southern French localities. The oldest record of *Castillomys rivas* is reported  
543 in earliest Pleistocene sites such as Tollo de Chiclana 10 and 10B (MN17; Minwer-  
544 Barakat et al. 2005) and Valdeganga 7 (MN17; Mein et al. 1978), whereas its last record  
545 is reported from the late Early Pleistocene level of Cúllar-Baza B (Agustí et al. 1999).

546  
547 Genus *Stephanomys* Schaub, 1938

548 *Stephanomys balcellsii* Gmelig Meyling and Michaux, 1973

549 Figure 6H–O

550 *Material.* Two left M1 (PCB-Sba-9, PCB-Sba-11), one right M1 (PCB-Sba-10), one left  
551 M2 (PCB-Sba-12), one right M2 (PCB-Sba-13), one left M3 (PCB-Sba-15), one right M3  
552 (PCB-Sba-14), one right m1 (PCB-Sba-16), one left m2 (PCB-Sba-18), one right m2  
553 (PCB-Sba-17), one left m3 (PCB-Sba-19).

554 *Description.* The eleven molars from Pedrera del Corral d'en Bruach share the main traits  
555 of the genus *Stephanomys*: the high crown, the development of longitudinal crests on the  
556 lower teeth, and the presence of posterior crests on the t1 and t3 in the upper teeth. The  
557 M1 has high crests connecting the cusps. There is a small t12. The t1bis is smaller than

558 the t2bis. In the M2, the t6 is slightly larger than the t9, and the t12 is poorly developed.  
559 In the M3, the t8 is separated from the t4. The lower molars have a high, longitudinal  
560 crest. The m1 lacks a tma, the anteroconid being asymmetrical. Both the m1 and m2 have  
561 the protoconid and hypoconid slightly displaced posteriorly with respect to the metaconid  
562 and entoconid. They both have a low, crest-shaped posterior heel, and a high labial  
563 cingulum. In the m3, the anterolabial cuspid is connected to the anterolabial part of the  
564 protoconid. The Late Miocene and Early Pliocene species of *Stephanomys*, such as *S.*  
565 *stadii*, *S. ramblensis*, *S. dubari*, *S. cordii*, *S. margaritae*, *S. vandeweerdi*, and *S.*  
566 *numidicus*, are smaller and have a lower crown and less accentuated stephanodonty than  
567 the studied molars (Mein and Michaux 1979; van de Weerd 1976; Cordy 1976; Adrover  
568 1986; Aguilar et al. 1991; Coiffait et al. 1985; Ruiz Bustos et al. 1984; Piñero et al. 2017a,  
569 2017b, 2018a; among others). The presence of a poorly-developed t1bis and t2bis, or even  
570 their absence, in the M1 of *S. prietaensis* (see Aguilar et al. 1993a) is the main difference  
571 with respect to the studied molars. Morphologically, *S. donnezani*, *S. thaleri* and *S. calveti*  
572 can be distinguished from the teeth under study by the presence of a tubercular posterior  
573 heel in the m1 and m2 (Depéret 1890; López-Martínez et al. 1998; Bachelet and Castillo-  
574 Ruiz 1990). The presence of a crest-shaped posterior heel is shared with *S. minor* and *S.*  
575 *progressus*. However, *S. minor* differs from the studied teeth in its smaller size (Gmelig  
576 Meyling and Michaux 1973; van de Weerd 1976; Castillo Ruiz 1990; Minwer-Barakat et  
577 al. 2005). The molars of *Stephanomys progressus* are slightly larger than those from  
578 Pedrera del Corral d'en Bruach. In addition, the M2 of *S. progressus* shows a clearly less-  
579 developed t9 than the studied M2 does (Cordy 1976; Minwer-Barakat et al. 2011). The  
580 dimensions of the teeth fit the size range of *Stephanomys balcellsii* from its type locality  
581 Islas Medas (Gmelig Meyling and Michaux 1973), Tollo de Chiclana 10 and 10B  
582 (Minwer-Barakat et al. 2005), Valdeganga I (Mein et al. 1978) and Almenara-Casablanca  
583 4 (originally published as Casablanca B; Gil and Sesé 1985; Agustí et al. 2011).  
584 Moreover, the large size (Table 7), hypsodonty, the development of longitudinal  
585 connections, the presence of a crest-shaped posterior heel in the m1 and m2, and the  
586 presence of a well-developed t9 in the M2 are consistent with this species. Accordingly,  
587 the specimens of *Stephanomys* from Pedrera del Corral d'en Bruach are identified as  
588 *Stephanomys balcellsii*.

589 *Remarks.* The genus *Stephanomys* is a common murid in the Late Miocene to Early  
590 Pleistocene rodent faunas of the Iberian Peninsula and France. The anagenetic  
591 evolutionary line *Stephanomys minor* – *Stephanomys balcellsii* – *Stephanomys progressus*  
592 underwent an increase in size, stephanodonty and crown height through the Pliocene and  
593 earliest Pleistocene (Cordy 1976; Aguilar et al. 1993a; Renaud et al. 2005; Minwer-  
594 Barakat et al. 2011). The descendant of *S. balcellsii*, i.e. *S. progressus*, is the most recent  
595 representative of the genus (Minwer-Barakat et al. 2011). The oldest records of *S.*  
596 *balcellsii* seem to be those from the Late Pliocene sites of Huélago-4 (MN16; Sesé 1989)  
597 and Almenara-Casablanca 4 (Gil and Sesé 1985; Agustí et al. 2011). However, Sesé  
598 (1989) had reservations in ascribing the material to this species, whereas Agustí et al.  
599 (2011) assigned the material from Almenara-Casablanca 4 (Late Pliocene) to *S.*  
600 *progressus*, which seems doubtful (no published descriptions, measurements or  
601 illustrations are available). Likewise, Agustí et al. (2011) identified the *Stephanomys*  
602 material from the somewhat younger site of Almenara-Casablanca 1 (Early Pleistocene)  
603 as *S. progressus*. We have revised some specimens of *Stephanomys* from Almenara-  
604 Casablanca 1 stored at the Institut de Paleoeecologia Humana i Evolució Social  
605 (Tarragona, Spain) in order to clarify their determination. We have found that this  
606 material fits better with *S. balcellsii* than with *S. progressus*, as all the available M2s  
607 develop a t9, a diagnostic character that differentiates *S. balcellsii* from *S. progressus* (see

608 Minwer-Barakat et al. 2011). There is therefore an inconsistency in the identification of  
609 the descendant of *S. balcellsii* in the older site of Almenara-Casablanca 4. This  
610 incongruence is best resolved if the material from the latter Late Pliocene locality  
611 corresponds to *S. balcellsii*, as Gil and Sesé (1985) had determined. Indeed, these authors  
612 reported the presence of a t9 in the M2s from Almenara-Casablanca 4. All the remaining  
613 populations of *S. balcellsii* have been identified in earliest Pleistocene localities (MN17):  
614 Islas Medas, Tollo de Chiclana 10 and 10B, Valdeganga I and Alfarerías (Gmelig  
615 Meyling and Michaux 1973; Mein et al. 1978; Minwer-Barakat et al. 2005; Ruiz Bustos  
616 1986).

617

618 Family CRICETIDAE Fisher, 1817

619

620 Subfamily CRICETINAE Fisher, 1817

621

622 Genus *Allocricetus* Schaub, 1930

623

624 *Allocricetus* sp.

625

626 Figure 6P

627

628 *Material.* One left m1 (PCB-All-1) (L=1.8 mm; W=1.3 mm).

629

630 *Description.* Given the development of the protolophid and the metalophid, as well as the  
631 mesalophid, the tooth in question can be ascribed to the genus *Allocricetus* in accordance  
632 with Cuenca-Bescós (2003) and Cuenca-Bescós et al. (1997). According to the  
633 Quaternary record of Western Europe, it could be one of the following three species: *A.*  
634 *bursae*, *A. ehiki* or *A. correzensis*. The cingular stylid could be a diagnostic character that  
635 separates the different species. The tooth under study has a well-developed cingular  
636 stylid, as is present in all three species but more frequent in *A. ehiki* and *A. correzensis*  
637 (Cuenca-Bescós, 2003). On the other hand, the measurements taken from the only  
638 identified m1 are consistent with those taken from the Early Pleistocene *A. bursae*  
639 specimens at the Hungarian sites of Osztramos 3 and Villány 3 (Hir 2002), differing from  
640 the *A. ehiki* specimens from the same site and from the *A. correzensis* identified at the  
641 Spanish Middle Pleistocene site of Sima de los Huesos (Cuenca-Bescós et al. 1997),  
642 which are larger in size. In summary, our specimen is morphologically closer to *A. ehiki*  
643 and *A. correzensis*, but metrically closer to *A. bursae*, preventing us from ascertaining the  
644 species level with a single tooth.

645

646 *Remarks.* The first records of the genus *Allocricetus* in Europe are from the Hungarian  
647 Gelasian sites (MN17) of Osztramos 3 and Villány 3 (Hir 1993). These were identified  
648 as *A. ehiki*. However, the most ancient records of this genus in Iberia are known from the  
649 Calabrian (post-Jaramillo) layers of the site of Gran Dolina (TD3-4) of the Sierra de  
650 Atapuerca, identified as *A. bursae* (Cuenca-Bescós et al. 2010), and from Almenara-  
651 Casablanca 3, Calabrian in age, identified as *A. bursae duraciensis* (Agustí et al. 2011).  
652 Accordingly, if the age of Pedrera del Corral d'en Bruach is confirmed as MN17 by the  
653 small-mammal association as a whole, this could be the oldest record known to date of  
654 the genus *Allocricetus* in the Iberian Peninsula.

655

656

657 Subfamily ARVICOLINAE Gray, 1821



658 Genus *Mimomys* Forsyth Major, 1910

659 *Mimomys medasensis* Michaux, 1971

660 Figure 7

661 *Material.* Six right m1 (PCB-Mm-1; PCB-Mm-5; PCB-Mm-8; PCB-Mm-9; PCB-Mm-  
662 10; PCB-Mm-12) six left m1 (PCB-Mm-2; PCB-Mm-3, PCB-Mm-4; PCB-Mm-6; PCB-  
663 Mm-7; PCB-Mm-11), one right M3 (PCB-Mn-13).

664 *Description.* In general, all the m1 are large in size (Table 8), comparable with the  
665 specimens identified in Almenara-Casablanca I (Gil and Sesé 1984), El Rincón I (Alberdi  
666 et al. 1997) and Tollo del Chiclana 10 (Minwer-Barakat et al. 2004). In occlusal view, the  
667 m1 present a connected T1-T2, scarcely differentiated enamel (*Mimomys*-type) with SDQ  
668 values between 156 and 166, comparable to that of other large-sized specimens from the  
669 ancient Early Pleistocene of central Europe such as *Mimomys ostramosensis* (Kosciow  
670 and Nadachowski 2002), relatively marked asymmetry between the labial and lingual  
671 triangles, and the presence of little cement in the re-entrant angles. The ACC of the m1  
672 in occlusal view is characterized by a T4 oriented backward, a T5 with a thick and  
673 rounded shape, two labial re-entrant angles (“inselfalte” and “prismenfalte”) that are  
674 shallow and relatively open, and in all cases the labial salient angle (“*Mimomys*-Kante”) is  
675 differentiated and the LRA4 deep and marked. Of all the m1 identified, only two  
676 specimens (PCB-Mm-1 and PCB-Mm-2) present an enamel islet, whereas in the rest of  
677 the identified teeth the islet appears open, showing the interspecific variability revealed  
678 in Sevilla et al. (1991). As in the lower molars, the only M3 is large in size (Table 8),  
679 comparable with specimens identified in Almenara-Casablanca I (Gil and Sesé 1984), El  
680 Rincón I (Alberdi et al. 1997) and Tollo del Chiclana 10 (Minwer-Barakat et al. 2004).  
681 In occlusal view, this tooth presents a little cement in the re-entrant angles and scarcely  
682 differentiated enamel. PL is isolated from T2, and T2 from T3; T4 is well delimited, and  
683 T5 is small but differentiated; the BRA1 is deep, and the LRA2 and BRA3 are relatively  
684 deep and opposed one another. It presents a large, ovoid enamel islet.

685 *Remarks.* As expounded above, the morphological traits of the *Mimomys* material  
686 identified at Pedrera del Corral d'en Bruach are comparable with those of the species *M.*  
687 *medasensis* of Islas Medas (Michaux 1971), Almenara-Casablanca 1 (Gil and Sesé 1984),  
688 El Rincón I (Alberdi et al. 1997), Tollo de Chiclana 10 (Minwer-Barakat et al. 2004) and  
689 Alto de la Ceradaña (Guillem-Calatayud et al. 2013). The presence of *M. medasensis* in  
690 Pedrera del Corral d'en Bruach indicates a chronological range that could correspond,  
691 according to Sesé (2006), to the MN17 biozone, within the Gelasian stage of the Early  
692 Pleistocene, dated to between ca. 2.6 and 1.8 Ma. In addition to the sites mentioned above,  
693 the Iberian Peninsula has other records of the species within the same chronological  
694 range: Cortes de Baza-1 (Peña 1975), Galera G (Agustí et al. 2001), and Alosaina  
695 (Aguilar et al. 1993a). The form *Mimomys* aff. *medasensis* has been identified at the latest  
696 Pliocene site of Villarroya in La Rioja (Laplana et al. 2016). Given its fossil record, it  
697 was thought to be an endemism restricted to the Mediterranean area of the Iberian  
698 Peninsula. However, Girotti et al. (2003) identified *M. medasensis* at the Torre Picchio  
699 site in Umbria, central Italy, showing, according to these authors, the possibility of  
700 occasional migration to the Italian Peninsula.

701

## 702 4. Discussion

703

### 704 4.1. Chronological remarks

705

706 From a chronological point of view, the small-mammal assemblage of Pedrera del Corral  
707 d'en Bruach can be assigned to the MN17 biozone (e.g. Valli, 2004), the Gelasian stage  
708 (ca. 2.5 - 1.8 Ma) (Rio et al. 1994). The most significant biochronological element is  
709 *Mimomys medasensis*, an arvicoline restricted to the lower part of MN17 (Minwer-  
710 Barakat et al. 2012; Agustí et al. 2015; among others). This rodent has also been found in  
711 other Iberian localities correlated with the earliest Pleistocene, such as Islas Medas  
712 (Michaux 1971), Almenara-Casablanca 1 (Agustí et al. 2011), Galera 2 (Agustí et al.  
713 2001), Tollo de Chiclana 10 (Minwer-Barakat et al. 2004), El Rincón I (Alberdi et al.  
714 1997), Alto de la Cerdaña (Guillem-Calatayud et al. 2013), Cortes de Baza-1 (Peña 1975),  
715 Aloxaina (Aguilar et al. 1993a) and Villarroya (Laplana et al. 2016). In addition to *M.*  
716 *medasensis*, the simultaneous occurrence of the murids *Castillomys rivas* and  
717 *Stephanomys balcellsii* is also characteristic of MN17 (Sesé 2006). The presence of the  
718 latter murid confirms that Pedrera del Corral d'en Bruach is chronologically close to the  
719 sites of Islas Medas, Tollo de Chiclana 10, Valdeganga I and Almenara-Casablanca 1  
720 (Fig. 8).

721

722 The presence of *M. medasensis* is typical of the *Kislangia gusii* Zone (Agustí et al. 2015),  
723 the earliest biozone established for the Pleistocene succession of the Guadix-Baza Basin  
724 (ca. 2.6 - 2.2 Ma). This biozone is equivalent to the *Mimomys medasensis* Zone defined  
725 by Minwer-Barakat et al. (2012) and immediately subsequent to the *Kislangia ischus*  
726 Zone proposed by Piñero et al. (2018) (3.0 - 2.6 Ma). The *Kislangia gusii* Zone is  
727 followed by the *Mimomys cf. reidi* Zone (2.2 - 1.85 Ma), which is correlated with the  
728 upper part of the MN17 biozone (Agustí et al. 2015) and characterized by the occurrence  
729 of a small, hypsodont arvicolid provisionally determined as *Mimomys cf. reidi*. In this  
730 biozone *K. gusii*, *M. medasensis* and *S. balcellsii* are no longer present. As shown by the  
731 Almenara-Casablanca 1 section, *Kislangia gusii* progressively disappeared through the  
732 lower part of MN17, whereas *M. medasensis* was still present (Agustí et al. 2011).  
733 Although the arvicoline sample from Pedrera del Corral d'en Bruach is not very  
734 extensive, the continued presence of *M. medasensis* together the absence of other  
735 arvicolines, as *K. gusii*, suggests that the site could be close in age to the transition  
736 between the *K. gusii* and *M. cf. reidi* biozones, at roughly 2.2 Ma (Fig. 8), and is therefore  
737 older than the lower boundary of the Olduvai geomagnetic subchron (1.94 - 1.78 Ma).

738

### 739 4.2. Species occurrence and environmental remarks

740 Given that the probable age of Pedrera del Corral d'en Bruach between 2.6 – 2.2 Ma and  
741 probably close to ca. 2.2 Ma, the presence of *Glirulus pusillus* constitutes the first record  
742 of this species in the Iberian Peninsula. *G. pusillus* is a rare component of the Late  
743 Pliocene and Early Pleistocene faunas of Europe (Nadachowski and Daoud 1995) and is  
744 represented in only a few sites, such as Les Valerots Bed 2 (Bonifay 1973), Tegelen (Van  
745 den Hoek Ostende 2003), Cascina Arondelli and the Fornace RDB Quarry (Kotsakis

746 1986), Podlesice (Kowalski 1956), Osztramos 7 (Janossy 1986) and Betfia 13 (Terzea  
747 1996). It had not been found until now in the Iberian Peninsula.

748 The presence of *Muscardinus avellanarius* and the genus *Allocricetus* in Pedrera del  
749 Corral d'en Bruach could likewise be the oldest mention of these taxa in the Iberian  
750 Peninsula. *M. avellanarius* is an extant species that is relatively well documented in the  
751 Late Pliocene and Early Pleistocene of central Europe (Nadachowski and Daoud 1995;  
752 Van den Hoek Oestende 2003; Striczky and Pazonyi 2014). Until now, however, its  
753 presence in the Iberian Peninsula has been restricted to the Late Pleistocene site of  
754 Lezetxiki II (Garcia-Ibaibarriaga et al. 2015). The genus *Allocricetus*, appearing as *A.*  
755 *ehiki*, has been identified in various Gelasian European sites, such as Osztramos 3 and  
756 Villány 3 (Hir 1993). In the Iberian Peninsula, however, the genus has to date been  
757 identified as *A. bursae* in the post-Jaramillo layers of Gran Dolina (TD3-4) in the Sierra  
758 de Atapuerca (Cuenca-Bescós et al. 2010), and as *A. bursae* aff. *balarucciensis* and *A.*  
759 *bursae duraciensis* in the likewise post-Jaramillo sites of Cueva Victoria and Almenara-  
760 Casablanca 3, respectively (Agustí 1982; Agustí et al. 2011). Furthermore, the presence  
761 of *Blarinoides mariae* in Pedrera del Corral d'en Bruach could be the most recent  
762 occurrence of the genus in the Iberian Peninsula, since the chronological range of  
763 *Blarinoides* is known to run from the Pliocene to the beginning of the Early Pleistocene  
764 in Europe (Reumer 1984; Rzebik-Kowalska 1998; Minwer-Barakat et al. 2007), although  
765 its presence in the Iberian Peninsula was until now apparently restricted to MN15 and  
766 MN16 (Furió et al. 2018).

767 Currently, the environment around Pedrera del Corral d'en Bruach is characterized  
768 mainly by scrubland with species such as kermes oak (*Quercus coccifera*) and the  
769 Mediterranean dwarf palm (*Chamaerops humilis*), with dry conditions and a low diversity  
770 in small mammals. The rodent-insectivore assemblage is now represented by *Apodemus*  
771 *sylvaticus*, *Mus spretus*, *Eliomys quercinus* and *Crocidura russula* (Solís et al. 2000). In  
772 contrast, the small-mammal assemblage of this area between 2.6 – 2.2 Ma was much more  
773 diverse, as has here been demonstrated. The surrounding environment of the Garraf  
774 Massif was probably more humid than nowadays, as suggested by the presence of  
775 insectivores of the genus *Talpa* and the red-toothed shrews *B. mariae*, *P. hungarica* and  
776 *D. cf. doukasi*. The landscape during the formation of Pedrera del Corral d'en Bruach was  
777 characterized by the development of a forest denser than the present shrubland and open  
778 woodland, as indicated by the occurrence of the murids *A. atavus* and *A. jeanteti* and the  
779 highly diversified glirid association featuring *G. minor*, *E. intermedius*, *G. cf. pusillus*,  
780 and *M. cf. avellanarius*. Such an interpretation is supported by the presence in the sample  
781 of a rather diverse assemblage of amphibians and reptiles, also indicating more humid  
782 local conditions than today in the area (Albanerpetontidae indet. and *Blanus* sp.), together  
783 with taxa typically associated with open-dry areas and Mediterranean woodlands (cf.  
784 *Pelobates cultripes*, Agamidae indet., *Pseudopus* sp., and *Zamenis scalaris*).

## 785 5. Conclusions

786

787 Our study of the small-mammal association of Pedrera del Corral d'en Bruach has led us  
788 to the following conclusions:

789

790 A very rich, diverse small-mammal association has been revealed, with 15 taxa among  
791 the 270 remains identified.

792 Chronological inferences from the small-mammal association show Pedrera del Corral  
793 d'en Bruach to be Gelasian in age; the site can be placed at *Kislangia gusii* biozone (ca.  
794 2.6 – 2.2 Ma) and probably could be close to the transition between the *Kislangia gusii*  
795 and *Mimomys cf. reidi* biozones (ca. 2.2 Ma).

796 The presence of *Glirulus cf. pusillus* in Pedrera del Corral d'en Bruach is the first record  
797 of the species known to date in Iberia. It could also be the oldest citation known to date  
798 of the genus *Allocricetus* and the species *Muscardinus avellanarius* and the latest  
799 occurrence of *Blarionides mariae* in the Iberian Peninsula.

800 Preliminary palaeoenvironmental observations show Pedrera del Corral d'en Bruach to  
801 have had a much greater diversity of small-mammal species than what is currently  
802 recorded in the area and an environment that was more humid than nowadays, featuring  
803 a landscape dominated by forest formations.

804

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## 825 **Authors contribution**

826 J.M.L.-G. designed the research. J.A., P.P., F.J.R.-S. and J.M.L.-G. studied rodent's  
827 material. M.F. studied insectivore's material. J.G. studied bat material. B.M.-S. studied  
828 pika material. H.-A. B. studied herpetofauna material. M.S and J.D. were responsible for  
829 the excavation and the studied material of the site. All the authors wrote and revise the  
830 manuscript.

831

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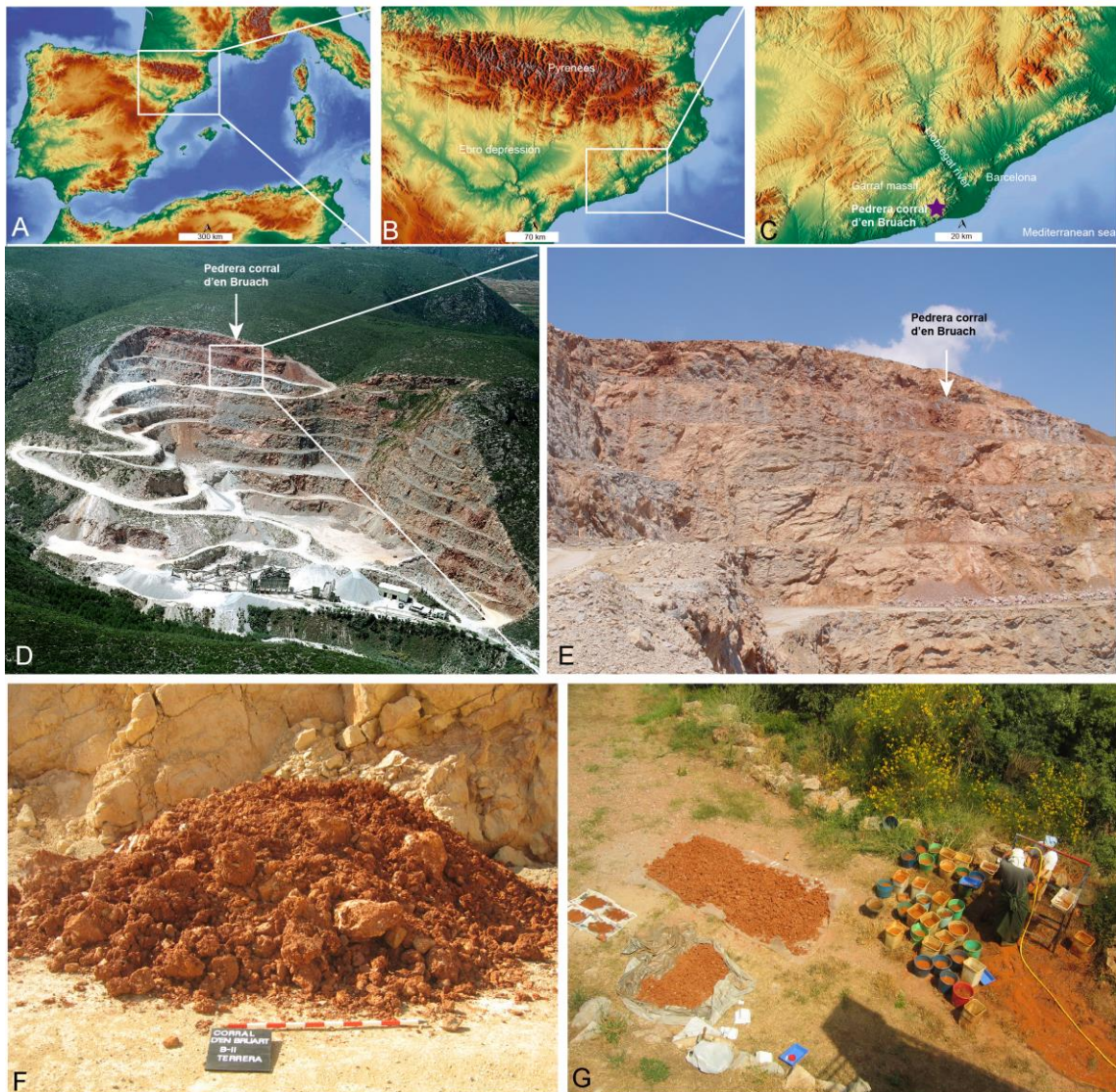
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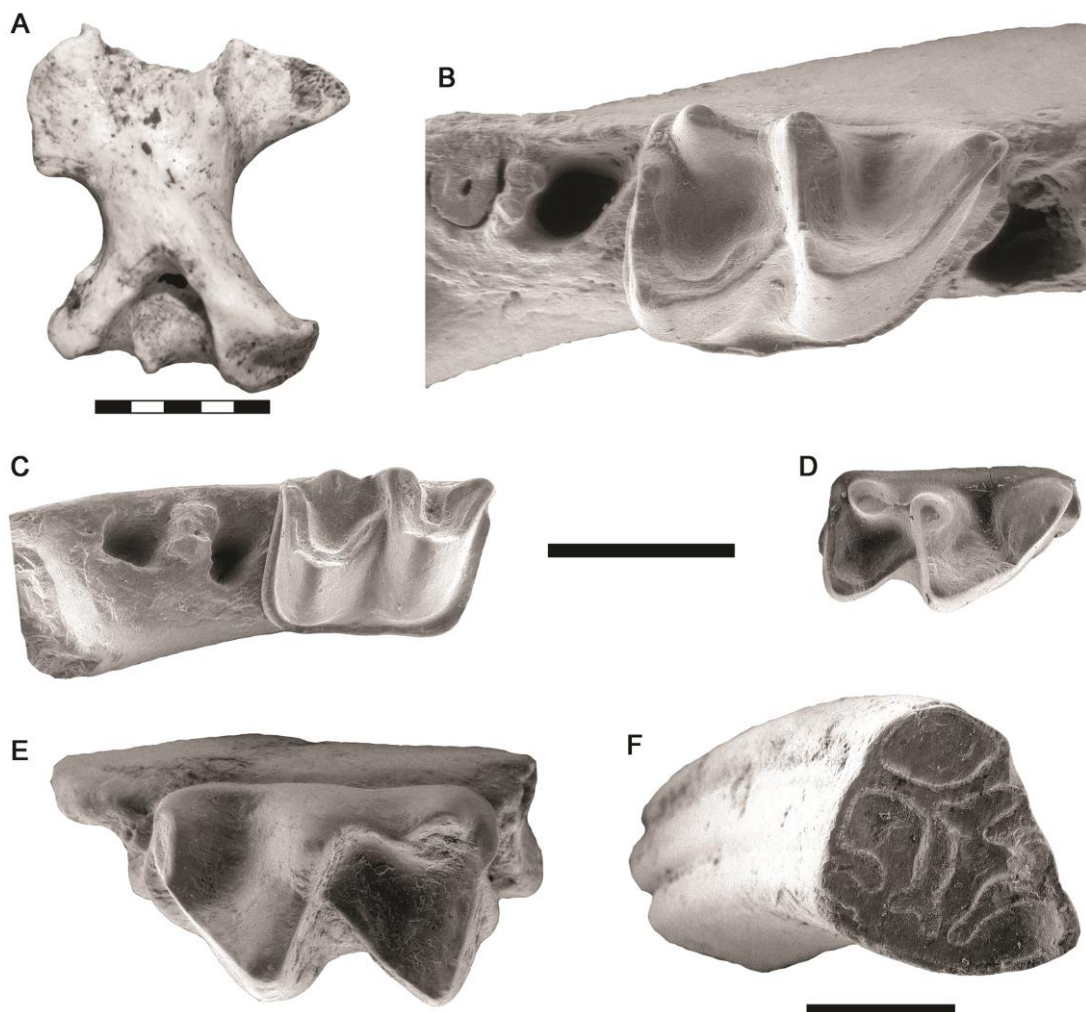
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1197 **FIGURE CAPTIONS**

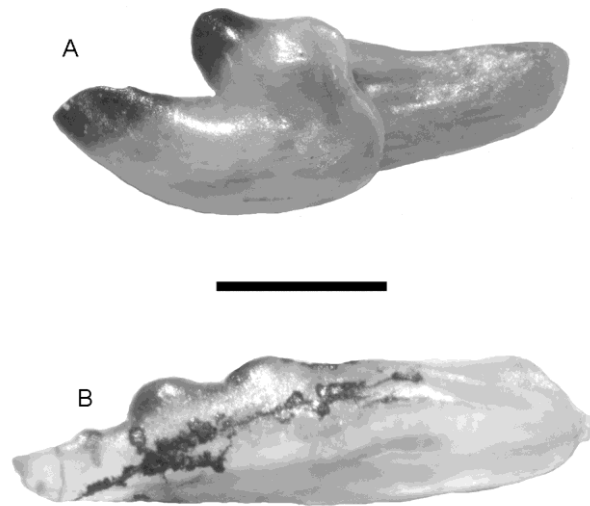


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1199 **Figure 1.** Pedrera del Corral d'en Bruach (Gavà, Barcelona). A-C Location of the  
 1200 palaeontological site. The map was downloaded from <http://maps-for-free.com/> (©  
 1201 OpenStreetMap contributors, accessed on 27 November 2022). The cartography in the  
 1202 OpenStreetMap map tiles is licensed under CC BY-SA  
 1203 ([www.openstreetmap.org/copyright](http://www.openstreetmap.org/copyright), accessed on 27 November 2022). The licence terms  
 1204 can be found on the following link: <http://creativecommons.org/licenses/by-sa/2.0/>  
 1205 (accessed on 27 November 2022). D. Corral d'en Bruach quarry indicating the location  
 1206 of the site. E. Position of the fissure where the fossil material appears inside the quarry.  
 1207 F-G. Picture showing sediments and the water screening of the sediments recovered from  
 1208 the fissure.



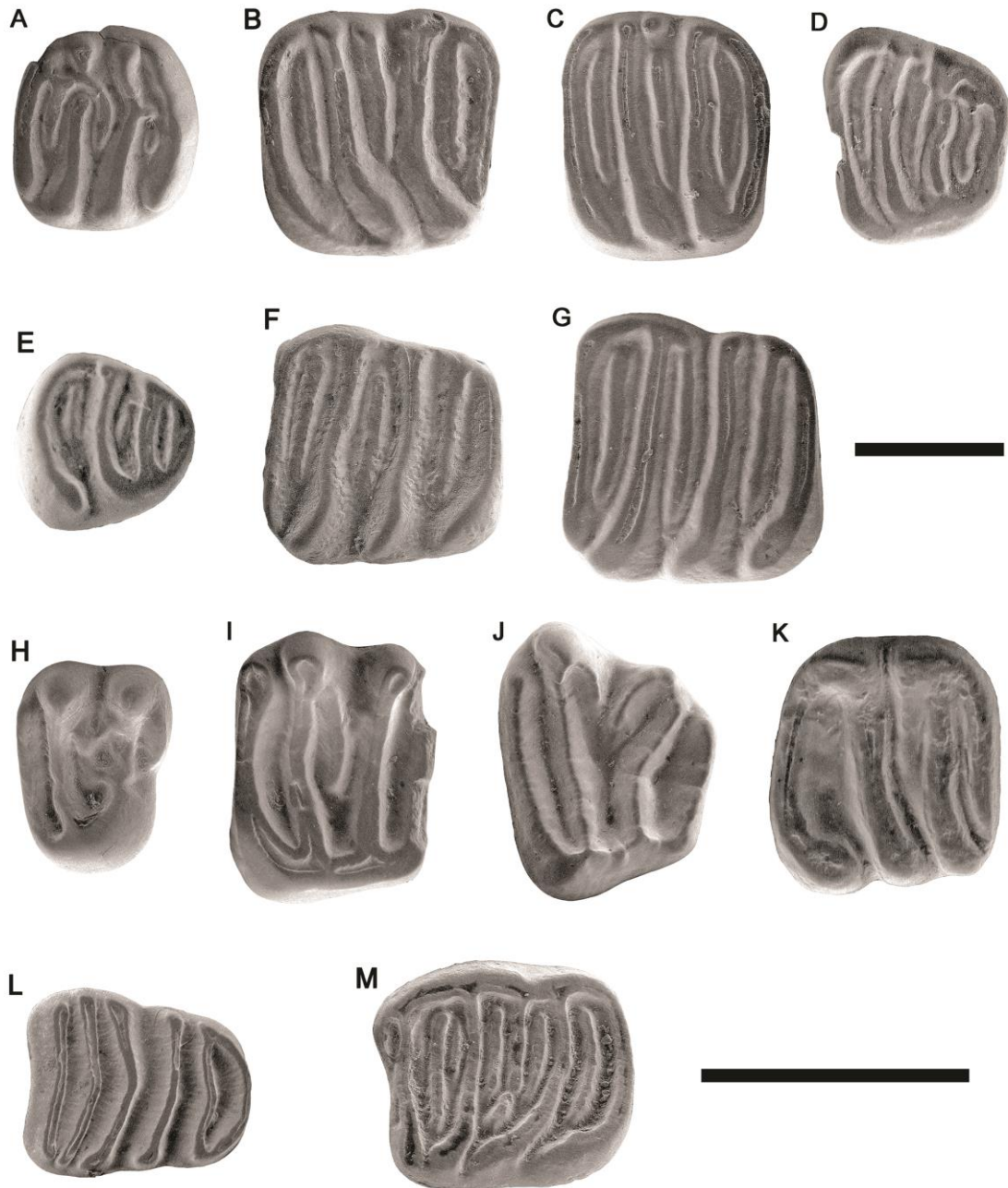
1209  
 1210 **Figure 2.** ESEM images of insectivores, chiropters, and lagomorph from Pedrera del  
 1211 Corral d'en Bruach (northeastern Spain). (A) *Talpa* cf. *fossilis*: right humerus, PCB-Ta-  
 1212 1. (B) *Blarinoides mariae*: right mandibular fragment with m2, PCB-BI-1. (C) *Petenyia*  
 1213 *hungarica*: right mandibular fragment with m2, PCB-Pe-1. (D) *Deinsdorfia doukasi*: right  
 1214 m1, PCB-De-1. (E) *Rhinolophus* gr. *ferrumequinum*: left m1, PCB-Rh-1. (F) *Prolagus* cf.  
 1215 *calpensis*: right p3, PCB-Pr-1. The upper scale bar represents 5 mm and goes with (A).  
 1216 The central scale bar represents 1 mm and goes with (B–E). The lower scale bar represents  
 1217 1 mm and goes with (F).



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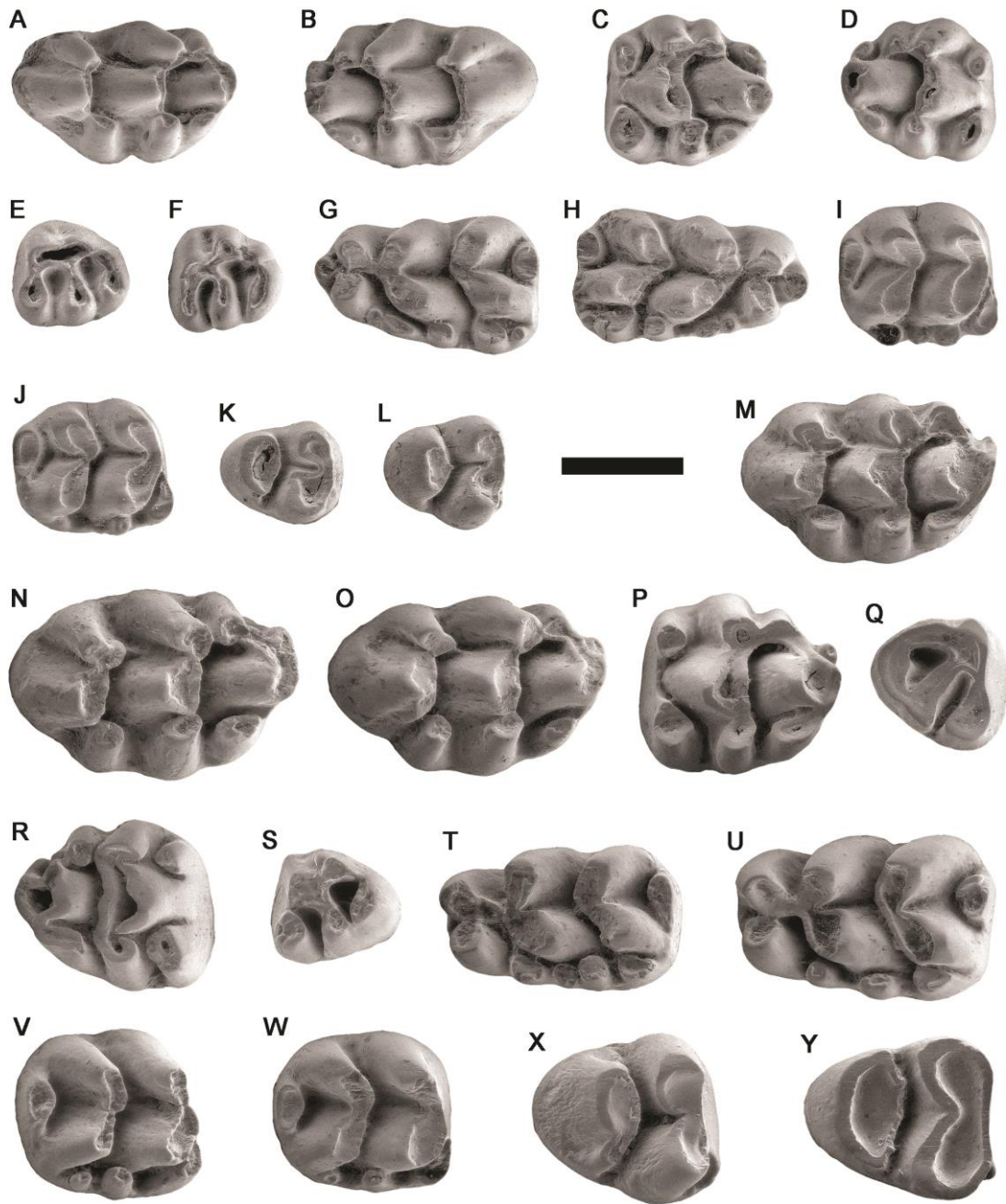
1219 **Figure 3.** Images of *Deinsdorfia doukasi* from Pedrera del Corral d'en Bruach  
1220 (northeastern Spain). (A) right I1 (PCB-De-4); (B) left i1 (PCB-De-5). Scale 1 mm.





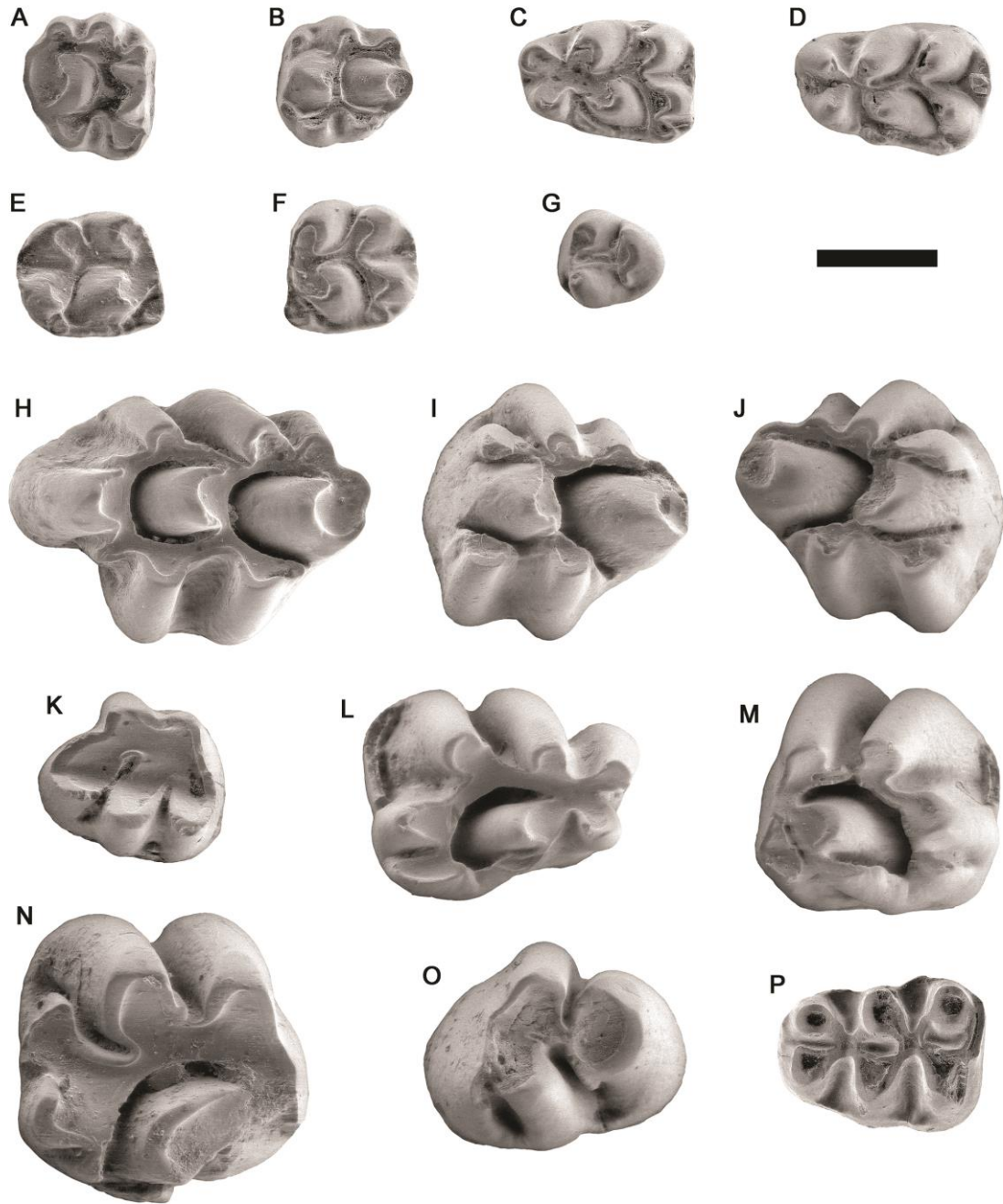
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1222 **Figure 4.** ESEM images of glirids from Pedrera del Corral d'en Bruach (northeastern  
 1223 Spain). (A–G) *Glis minor*: (A) right P4, PCB-Gm-32; (B) left M1, PCB-Gm-47; (C) left  
 1224 M2, PCB-Gm-30; (D) left M3, PCB-Gm-18; (E) right p4, PCB-Gm-5; (F) left m1, PCB-  
 1225 Gm-9; (G) left m2, PCB-Gm-38. (H–K) *Eliomys intermedius*: (H) right P4, PCB-Ein-43;  
 1226 (I) left M1-2, PCB-Ein-1; (J) left M3, PCB-Ein-17; (K) right m2, PCB-Ein-22. (L)  
 1227 *Muscardinus cf. avellanarius*: right m1, PCB-Mu-35. (M) *Glirulus cf. pusillus*: right m2,  
 1228 PCB-Gpu-23. Scale bar represents 1 mm. The upper scale bar goes with (A–L), whereas  
 1229 the lower one goes with (M).



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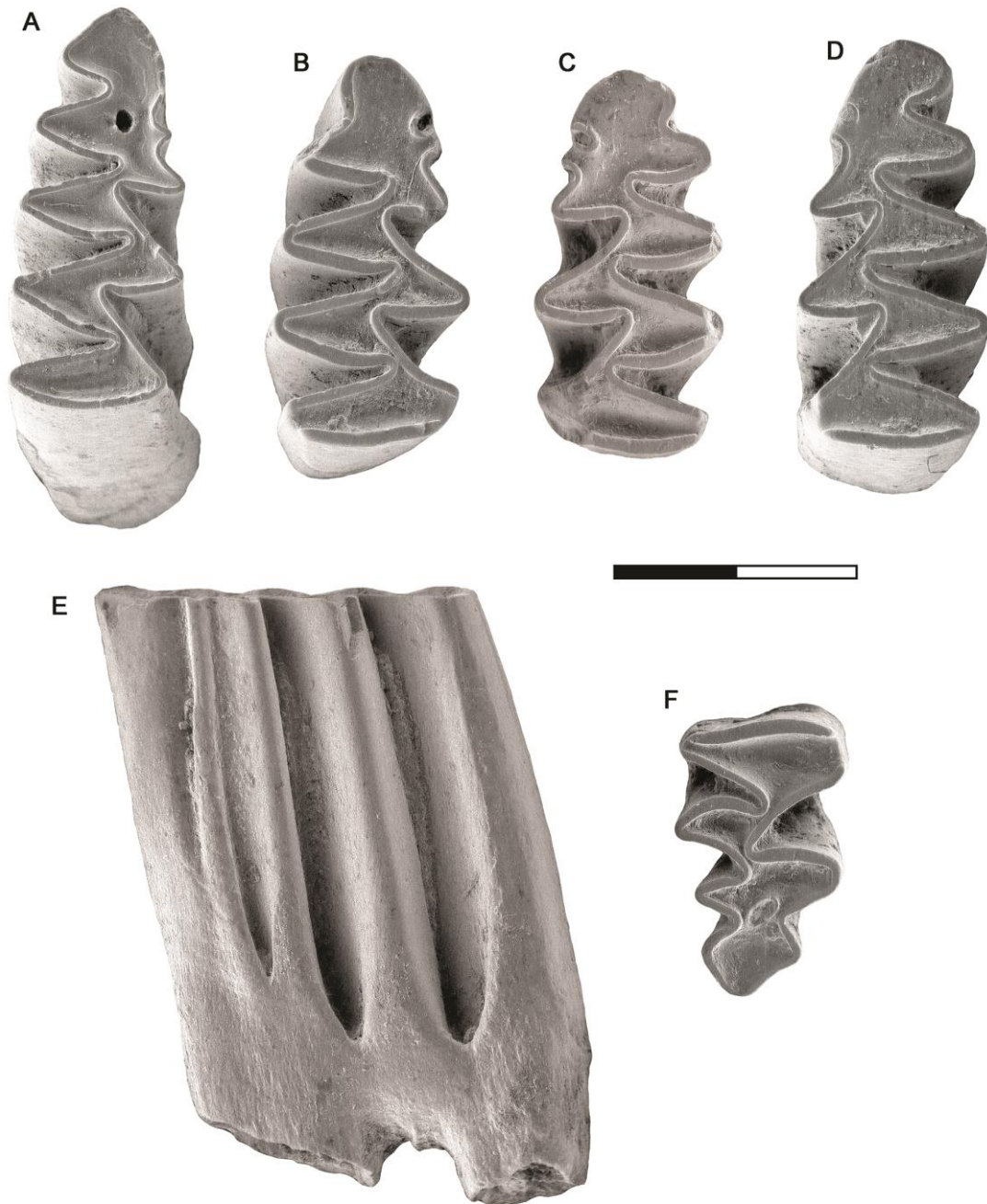
1231 **Figure 5.** ESEM images of murids from Pedrera del Corral d'en Bruach (northeastern  
 1232 Spain). (A–L) *Apodemus atavus* (A) left M1, PCB-Aat-25; (B) right M1, PCB-Aat-31;  
 1233 (C) left M2, PCB-Aat-36; (D) right M2, PCB-Aat-43; (E) left M3, PCB-Aat-52; (F) left  
 1234 M3, PCB-Aat-53; (G) left m1, PCB-Aat-65; (H) right m1, PCB-Aat-77; (I) right m2,  
 1235 PCB-Aat-89; (J) right m2, PCB-Aat-108; (K) right m3, PCB-Aat-121; (L) right m3, PCB-  
 1236 Aat-125. (M–Y) *Apodemus jeanteti*: (M) left M1, PCB-Aje-38; (N) left M1, PCB-Aje-  
 1237 40; (O) left M1, PCB-Aje-44; (P) left M2, PCB-Aje-55; (Q) right M2, PCB-Aje-59; (R)  
 1238 right M3, PCB-Aje-68; (S) left M3, PCB-Aje-70; (T) left m1, PCB-Aje-2; (U) left m1,  
 1239 PCB-Aje-5; (V) right m2, PCB-Aje-17; (W) right m2, PCB-Aje-22; (X) right m3, PCB-  
 1240 Aje-31; (Y) right m3, PCB-Aje-32. Scale bar represents 1 mm.



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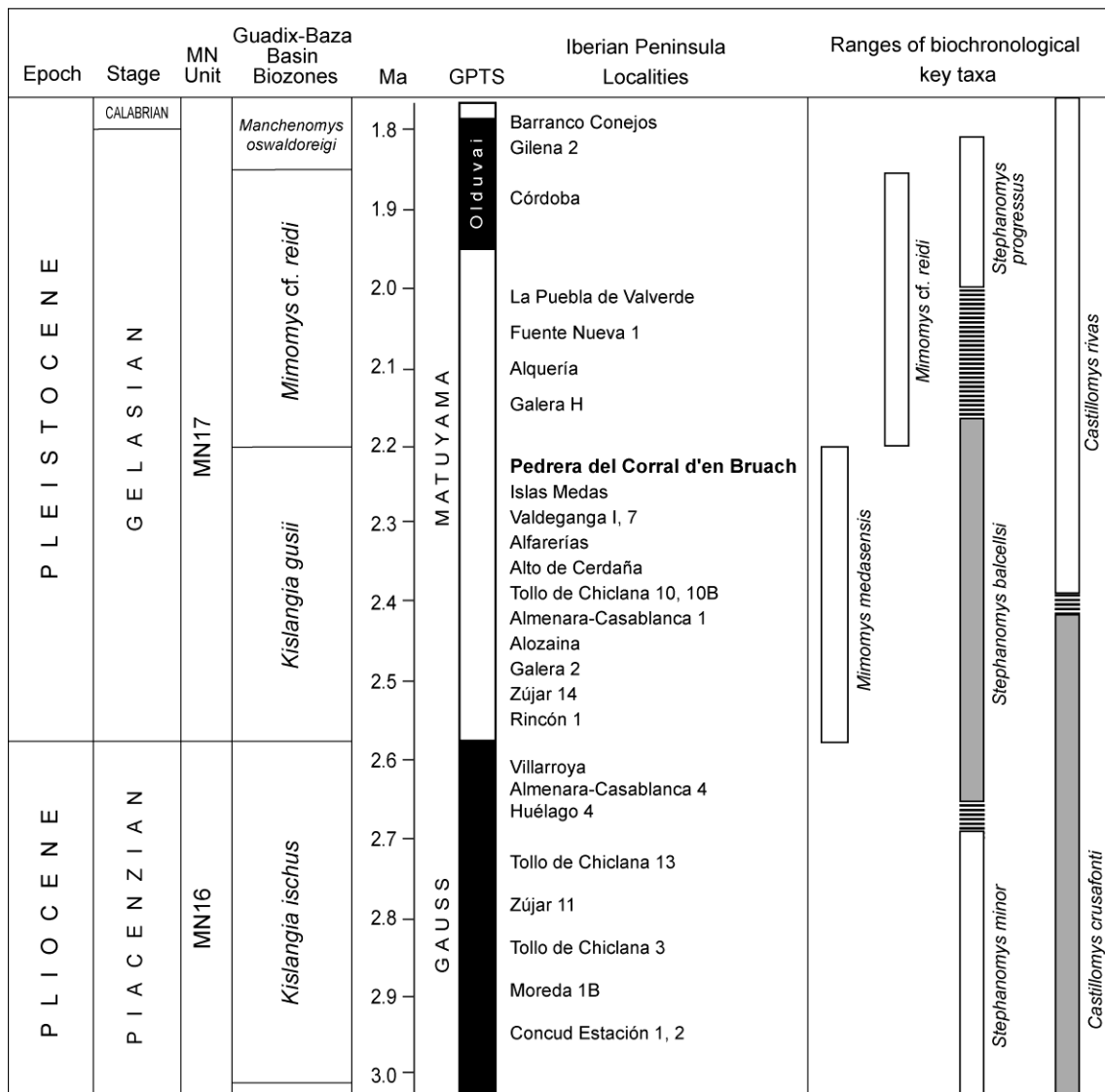
1242 **Figure 6.** ESEM images of murids and cricetids from Pedrera del Corral d'en Bruach  
 1243 (northeastern Spain). (A–G) *Castillomys rivas*: (A) right M2, PCB-Cri-1; (B) left M2,  
 1244 PCB-Cri-2; (C) left m1, PCB-Cri-3; (D) left m1, PCB-Cri-4; (E) right m2, PCB-Cri-5;  
 1245 (F) left m2, PCB-Cri-6; (G) left m3, PCB-Cri-8. (H–O) *Stephanomys balcellsii*: (H) left  
 1246 M1, PCB-Sba-9; (I) left M2, PCB-Sba-12; (J) right M2, PCB-Sba-13; (K) right M3, PCB-  
 1247 Sba-14; (L) right m1, PCB-Sba-16; (M) left m2, PCB-Sba-18; (N) right m2, PCB-Sba-  
 1248 17; (O) left m3, PCB-Sba-19. (P) *Allocricetus* sp.: left M1, PCB-All-1. Scale bar  
 1249 represents 1 mm.





1250

1251 **Figure 7.** ESEM images of *Mimomys medasensis* from Pedrera del Corral d'en Bruach  
 1252 (northeastern Spain). (A) right m1 in occlusal view, PCB-Mm-1. (B) right m1 in occlusal  
 1253 view, PCB-Mm-5. (C) left m1 in occlusal view, PCB-Mm-3. (D) left m1 in occlusal view,  
 1254 PCB-Mm-4. (E) left m1 in lateral view, left m1 in occlusal view, PCB-Mm-2. (F) right  
 1255 M3 in occlusal view, PCB-Mm-13. Scale bar represents 2 mm.



1256

1257 **Figure. 8.** Biostratigraphic correlation between Pedra del Corral d'en Bruach and  
 1258 various Iberian localities, with the biochronologies proposed by Agustí et al. (2015) and  
 1259 Piñero et al. (2018), and the geomagnetic polarity time-scale (GPTS).

1260

1261 **TABLE CAPTIONS**

	NISP	MNI	%MNI
<i>Talpa cf. fossilis</i>	3	2	3.64
<i>Blarinoides mariae</i>	1	1	1.82
<i>Petenya hungarica</i>	1	1	1.82
<i>Deinsdorfia doukasi</i>	5	1	1.82
<i>Rhinolophus cf. ferrumequinum</i>	1	1	1.82
<i>Prolagus cf. calpensis</i>	1	1	1.82
<i>Glis minor</i>	15	3	5.45
<i>Eiomys intermedius</i>	10	4	7.27
<i>Glirulus cf. pusillus</i>	1	1	1.82

<i>Muscardinus cf. avellanarius</i>	1	1	1.82
<i>Apodemus atavus</i>	128	19	34.55
<i>Apodemus jeanteti</i>	71	9	16.36
<i>Castillomys rivas</i>	7	2	3.64
<i>Stephanomys balcellsii</i>	11	2	3.64
<i>Allocricetus sp.</i>	1	1	1.82
<i>Mimomys medasensis</i>	13	6	10.91
<b>Total</b>	<b>270</b>	<b>55</b>	<b>100</b>

1262

1263 **Table 1.** Representation of the small-mammal species identified at Pedrera del Corral  
1264 d'en Bruach in terms of the number of identified specimens (NISP), the minimum number  
1265 of individuals (MNI), and the MNI as a percentage.

Element	Length					Width				
	N	min	mean	max	$\sigma$	N	min	mean	max	$\sigma$
p4	2	1.09	1.10	1.10	0.01	2	1.12	1.13	1.14	0.01
m1	5	1.61	1.67	1.71	0.05	4	1.44	1.53	1.61	0.09
m2	1		1.73			1		1.73		
m3	2	1.60	1.62	1.63	0.02	2	1.42	1.44	1.45	0.02
P4	1		1.31			1		1.44		
M1	2	1.66	1.68	1.69	0.02	2	1.69	1.78	1.87	0.13
M2	1		1.43			1		1.65		
M3	1		1.22			1		1.49		

1266

1267 **Table 2.** Measurements of the identified elements (N) of *Glis minor* from Pedrera del  
1268 Corral d'en Bruach in millimetres. Min: minimum, max: maximum;  $\sigma$  standard deviation.

Element	Length					Width				
	N	min	mean	max	$\sigma$	N	min	mean	max	$\sigma$
m2	1		1.44			1		1.66		
P4	1		1.06			1		1.34		
M1-M2	3	1.42	1.52	1.61	0.10	3	1.69	1.77	1.84	0.08
M3	5	1.26	1.33	1.48	0.10	5	1.50	1.70	1.89	0.16

1269

1270 **Table 3.** Measurements of the identified elements (N) of *Eliomys intermedius* from  
1271 Pedrera del Corral d'en Bruach in millimetres. Min: minimum, max: maximum;  $\sigma$   
1272 standard deviation.

Element	Length					Width				
	N	min	mean	max	$\sigma$	N	min	mean	max	$\sigma$
M1	30	1.91	2.07	2.25	0.07	31	1.21	1.32	1.49	0.06
M2	19	1.26	1.41	1.54	0.07	19	1.13	1.26	1.36	0.07
M3	7	1.01	1.04	1.10	0.04	7	0.93	0.96	1.06	0.05
m1	24	1.74	1.92	2.04	0.08	26	1.04	1.15	1.22	0.05
m2	28	1.24	1.37	1.50	0.06	29	1.08	1.21	1.30	0.06
m3	9	1.06	1.12	1.23	0.07	10	0.90	1.01	1.16	0.08

1273

1274 **Table 4.** Measurements of the identified elements (N) of *Apodemus atavus* from Pedrera  
 1275 del Corral d'en Bruach in millimetres. Min: minimum, max: maximum;  $\sigma$  standard  
 1276 deviation.

Element	Length					Width				
	N	min	mean	max	$\sigma$	N	min	mean	max	$\sigma$
M1	15	2.18	2.37	2.62	0.11	17	1.39	1.51	1.65	0.06
M2	13	1.53	1.68	1.84	0.11	13	1.37	1.46	1.57	0.06
M3	4	1.21	1.24	1.29	0.04	4	1.00	1.10	1.16	0.07
m1	13	2.00	2.14	2.30	0.09	13	1.23	1.33	1.44	0.07
m2	14	1.51	1.63	1.80	0.08	14	1.25	1.40	1.52	0.07
m3	7	1.35	1.47	1.69	0.15	7	1.18	1.29	1.45	0.10

1277

1278 **Table 5.** Measurements of the identified elements (N) of *Apodemus jeanteti* from Pedrera  
 1279 del Corral d'en Bruach in millimetres. Min: minimum, max: maximum;  $\sigma$  standard  
 1280 deviation.

Element	Length					Width				
	N	min	mean	max	$\sigma$	N	min	mean	max	$\sigma$
M2	2	1.18	1.19	1.20	0.01	2	1.15	1.19	1.23	0.06
m1	2	1.53	1.62	1.70	0.12	2	1.03	1.08	1.12	0.06
m2	3	1.16	1.19	1.24	0.04	3	1.04	1.08	1.10	0.04
m3	1	-	0.91	-	-	1	-	0.81	-	-

1281

1282 **Table 6.** Measurements of the identified elements (N) of *Castillomys rivis* from Pedrera  
 1283 del Corral d'en Bruach in millimetres. Min: minimum, max: maximum;  $\sigma$  standard  
 1284 deviation.

Element	Length					Width				
	N	min	mean	max	$\sigma$	N	min	mean	max	$\sigma$
M1	1	-	3.19	-	-	3	2.23	2.36	2.43	0.11
M2	2	2.38	2.45	2.52	0.10	2	2.22	2.24	2.25	0.02
M3	2	1.73	1.83	1.92	0.13	2	1.48	1.50	1.52	0.03
m1	1	-	2.52	-	-	1	-	1.89	-	-
m2	2	2.21	2.37	2.52	0.22	2	2.14	2.31	2.47	0.23
m3	1	-	2.48	-	-	1	-	1.86	-	-

1285

1286 **Table 7.** Measurements of the identified elements (N) of *Stephanomys balcellsii* from  
 1287 Pedrera del Corral d'en Bruach in millimetres. Min: minimum, max: maximum;  $\sigma$   
 1288 standard deviation.

Element	Length					Width				
	N	min	mean	max	$\sigma$	N	min	mean	max	$\sigma$
m1	5	3.39	3.49	3.62	0.09	5	1.61	1.68	1.73	0.04
M3	1		2.45			1		1.53		

1289

1290 **Table 8.** Measurements of the identified elements (N) of *Mimomys medasensis* from  
1291 Pedrera del Corral d'en Bruach in millimetres. Min: minimum, max: maximum;  $\sigma$   
1292 standard deviation.

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