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A Brief Note on the Presence of the Common Hamster during the Late Glacial Period in Southwestern France

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Abstract: The Late Glacial period is characterized by slow warming, punctuated by short, cold episodes, such as the Younger Dryas (i.e., GS1). The impact of this climatic event on the mammal community is still poorly documented in southwestern France. Here, a new radiocarbon date obtained directly on fossil remains of common hamster, *Cricetus cricetus*, confirms its presence in southwestern France during the Younger Dryas (GS1). This observation currently suggests that *C. cricetus* could be an accurate chronological indicator of this event in southwestern France. In this particular case, it also demonstrates an attritional death, polluting the deposit, these remains having been found in the Combe-Cullier layer, attributed to an earlier period.

Keywords: *Cricetus cricetus*; rodent; paleobiogeography; Younger Dryas; radiocarbon date

The common hamster, *Cricetus cricetus*, is a medium-sized fossorial rodent with a weight varying between 150 g and 550 g. The current distribution of this rodent in Eurasia is limited between 42° and 55° North and 5° and 95° East, constrained by the July and January isotherms (+17 °C and +2 °C, respectively) and soft soils in which to dig their galleries [1,2]. Thus, the common hamster is mainly found in the steppes and grasslands of Western Asia and Eastern Europe, whereas its range is fragmented in the west. One such population, in Alsace, exploded during the first part of the twentieth century [3]. However, over the last 30 years, partly due to urbanization and change in agricultural practice, the status of the common hamster passed from that of an invasive species to that of a protected one [4]. The common hamster is thus currently classed as "strictly protected", with a population in Alsace of fewer than 1000 individuals.

Fossil remains appear regularly in many localities in Eastern and Central Europe [5], but are still rare in the fossil record in comparison with the remains of voles. Therefore, the past distributions of cricetids and their evolution are not well known (e.g., [6]), particularly in regions such as southwestern France, where the eastern plains terminate with mountains and oceanic barriers. Nevetheless, over the last 130,000 years, three species of Cricetinae were observed in southwestern France: *Allocricetulus bursae*, which disappeared during the last interglacial period [7]; the migratory hamster, *Cricetulus migratorius*, which has been observed at Mousterian sites in Charente, dated to Marine Isotope Stage 3 (e.g., [7,8]); and the common hamster, *C. cricetus*.

Remains of this latter larger cricetid are almost entirely limited to the eastern part of France [7,9–11], except for three sites in southwestern France, where hamster fossil remains have been observed: Artenac (Charente) in levels attributed to Marine Isotope Stage 5/4 [12]; Taillis-des-Coteaux (Vienne), where five post-cranial remains have been found in levels dated between 17.4 and 21.1 cal ky BP [13]; and Peyrazet (Lot) where three dental remains have been found in recent Laborian levels

dated to ca 11.2 cal ky BP [14,15]. However, the remains from this last site were located in the upper part of the stratigraphy, not very far from the soil surface, at the limit between the two first layers. Being mainly associated with temperate and mountain species, it has been suggested that these remains could most likely be attributed to the Younger Dryas (i.e., GS1 [16]).

The scarcity of remains associated with this rodent in this region led us to question the chronology of its presence as well as the continuity of its distribution at the end of the Late Pleistocene, despite the sizeable climatic variations. This paper describes a recent discovery of *C. cricetus* remains found at Combe-Cullier (Lot, France), a site that offers us the opportunity to better understand their palaeobiogeography.

The site of Combe-Cullier is located in the Lot region, in the area of Lacave, near Rocamadour. The site, which was discovered in the early twentieth century, was notably excavated discontinuously by A. Viré between 1906 and 1935 [17–19]. Between 1964 and 1974, J.F. Flies then carried out excavations on the mound in front of the cave, the findings of which are still largely unpublished. The material and stratigraphy of this excavation are currently being reevaluated [20–22] in order to propose a new archaeo-stratigraphy. Initial results showed a chronological succession of lithic industry and fauna from the Lower to Upper Magdalenian, without any stratigraphic inversion (e.g., [22,23]).

A few small mammal remains were collected by Flies during his excavations [24]. This material allowed us to identify 70 different bone remains, not mentioned previously by Delpech [24], which we believe come from one common hamster individual (*C. cricetus*). Indeed, these remains were grouped in the same small box, leading us to suppose that they came from a single collection removed during the excavations. All the bones show a similar patina. All the post-cranial elements are present, including the humerus, femur, pelvis, vertebra, costal, metapodial and phalange remains. The two mandibular and hemi-maxillary remains showed similar dental wear. No elements showed any signs suggesting the presence of an additional individual. Moreover, no breakage or digestion marks were observed. These remains come from level C4'2, which according to the new archaeo-stratigraphy is attributed to the Upper Magdalenian [23].

The site of Combe-Cullier (Lot) is situated less than 15 km from the site in Peyrazet. These two sites present complementary stratigraphies, with that of Combe-Cullier preceding that of Peyrazet. The two sites document the only two fossil occurrences of the common hamster at such low latitude, potentially suggesting the (semi-)continuous presence of this taxon in this region during the latter part of the Late Pleistocene.

This is based, however, on the working hypothesis of a strict association between the rodent remains and the archaeostratigraphy, and thus of a good archaeological integrity between the two sites. In the case of the remains from Peyrazet, two difficulties in interpretation are encountered: (1) the remains were discovered in the upper levels, close to the soil surface. Due to this delicate archaeological context, preventing clear association with any specific period, they could just as well be modern as medieval (presence of *Rattus rattus* and *Glis glis* [14]) or Laborian, which seems most likely; (2) they were poorly preserved, precluding any radiocarbon dates. Nonetheless, by considering both the European context and the archaeological one, the most likely hypothesis is that the distribution of this common hamster could have extended into southwestern France during the Younger Dryas, the last cold period before the Holocene warming [15]. In the case of Combe-Cullier, no taphonomic analysis can be performed, because there are no further small mammal remains, preventing us from evaluating the integrity of the site and the remains. It is worth noting that the common hamster is a burrowing species. Finding a complete individual, as during this excavation, could suggest death in its gallery, even if such cases are rare, as was demonstrated with regard to rabbit warrens [25].

A radiocarbon date was obtained directly from several of the hamster bones together weighing around 120 mg. The sample was dated at the Oxford Radiocarbon Accelerator Unit (University of Oxford, Oxford, UK) and was treated according to the Oxford Radiocarbon Accelerator Unit standard procedures for bones. The radiocarbon date obtained on the hamster remains (OxA-34939) is 10,295 $\pm$ 50 uncalibrated years BP. Using the IntCal13 calibration curve [26], a time

interval was obtained at 2σ of between 12,384 and 11,833 cal yr BP (Figure 1), indicating the latter part of the Younger Dryas (GS1). The radiocarbon date of the hamster remains from Combe-Cullier thus confirms the hypothesis proposed for the Peyrazet remains, with the presence of the hamster extending into southwestern France, thanks to the opportunity afforded by the climatic conditions of the Younger Dryas. If *C. cricetus* thus seems a good biochronological taxa for the Younger-Dryas event in southwestern France, the lack of further data does not, however, allow us to presently evaluate the exact chronology of the presence of this taxon in this region.

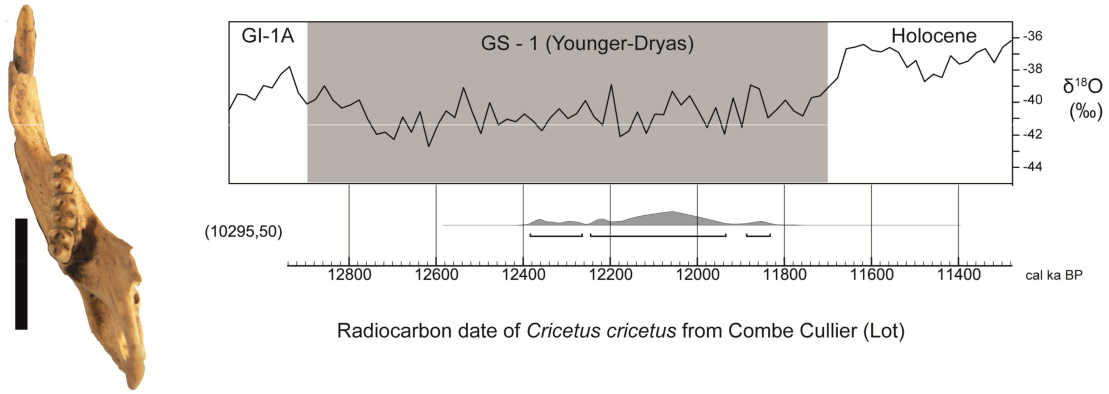

Figure 1. Photograph of the common hamster mandible from Combe Cullier (Lot) with the radiocarbon date obtained from bone remains calibrated with OxCal v4.3.2 [27] and IntCal13 [26]. The radiocarbon date was reported along the oxygen isotope compositions from the Greenland ice core record (GICC05). Scale = 1 cm.

In addition, this study also illustrates the caution needed with burrowing species. If such cases are carefully considered (e.g., [28,29]), they are always particularly difficult to demonstrate, especially when burrows were dug in the past. The advent of radiocarbon dating performed directly on large or medium-sized mammals offers a unique opportunity for us to ensure the integrity of faunal assemblages, and to identify intrusive burrowers (e.g., [30,31]). The recent improvement of methods allowing the extraction of smaller sample sizes [32,33] now offers new applications for smaller-sized mammals, and thus, the opportunity to explore the integrity of small mammal assemblages within the surrounding archaeological material and sites.

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