Reassessing the evolutionary history of *Oryctolagus*: Morphological diversity and biogeographic patterns in the early Pleistocene

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Abstract. This article critically examines recent findings on the evolutionary history of the genus *Oryctolagus*, focusing on the 2021 study by Maxime Pelletier. The research investigates the morphological diversity, evolution, and dispersal patterns of early Pleistocene rabbits in Western Europe, emphasizing the significance of the third lower premolar (p3) in taxonomic identification. The study reveals substantial morphological variability influenced by taxonomy and geographical factors, suggesting that climate fluctuations played a key role in shaping evolutionary trajectories. Through morphometric analyses, Pelletier challenges traditional species identification criteria and calls for a reassessment to avoid overestimating species diversity. These findings provide valuable insights into the evolutionary processes affecting small mammals and highlight the importance of integrating multiple analytical approaches in paleontology.
Key Words: *Oryctolagus*, Pleistocene rabbits, morphological diversity, biogeography, morphometrics, taxonomy, climate influence, fossil analysis, small mammal evolution.

The origin and evolution of the genus *Oryctolagus* have always sparked particular interest among zoologists and paleontologists, but the existing data are rather scarce and imprecise (Bud et al 2011; Petrescu-Mag et al 2019). The purpose of this news and views article with critical notes is to present and analyze recent research on the evolutionary history of the genus *Oryctolagus*, focusing on Maxime Pelletier's 2021 study. It discusses the morphological diversity, evolution, and biogeography of early Pleistocene rabbits, emphasizing the significance of dental morphology in taxonomic identification.

Maxime Pelletier (2021) conducted a study on the morphological diversity, evolution, and biogeography of early Pleistocene rabbits of the genus *Oryctolagus*. Affiliated with the University of Oulu in Finland, Pelletier aimed to clarify the phylogeny and evolutionary history of these rabbits, focusing on their morphological variability and dispersal patterns in Western Europe. Although previous studies acknowledged the presence of multiple endemic *Oryctolagus* species in the region (Angelone 2013; Peltier et al 2015), the relationships among these species and their evolutionary trajectory remained unclear. The study sought to resolve these uncertainties by analyzing fossil specimens using a combination of traditional morphometric methods and geometric morphometrics (Pelletier 2021).

To investigate the morphological diversity of early Pleistocene Oryctolagus, Pelletier (2021) examined the third lower premolar (p3), a tooth widely used for distinguishing leporid species due to its taxonomic and phylogenetic significance (Figure 1). The research incorporated qualitative morphological descriptions, linear measurements, and two-dimensional geometric morphometrics to assess intra- and inter-regional variations among different populations. Fossil samples from various early Pleistocene sites across Western

Europe were included, and their dental traits were compared with modern *Oryctolagus cuniculus* populations to evaluate evolutionary trends (Pelletier 2021).

The study revealed significant morphological variability within early Pleistocene *Oryctolagus* species (see Figure 2). Results indicated that both taxonomy and geographical factors influenced the shape and size of the p3, suggesting that climate and environmental conditions played a major role in shaping these traits (Pelletier 2021). Morphometric analyses demonstrated that certain dental features, previously considered diagnostic for species identification, were subject to substantial variability. Consequently, Pelletier (2021) recommended a reassessment of these criteria to avoid overestimating species diversity based on minor morphological differences. Additionally, the study provided new insights into the dispersal patterns of *Oryctolagus* in Western Europe, proposing that climate fluctuations during the early Pleistocene significantly influenced their evolutionary trajectory and biogeographic distribution.

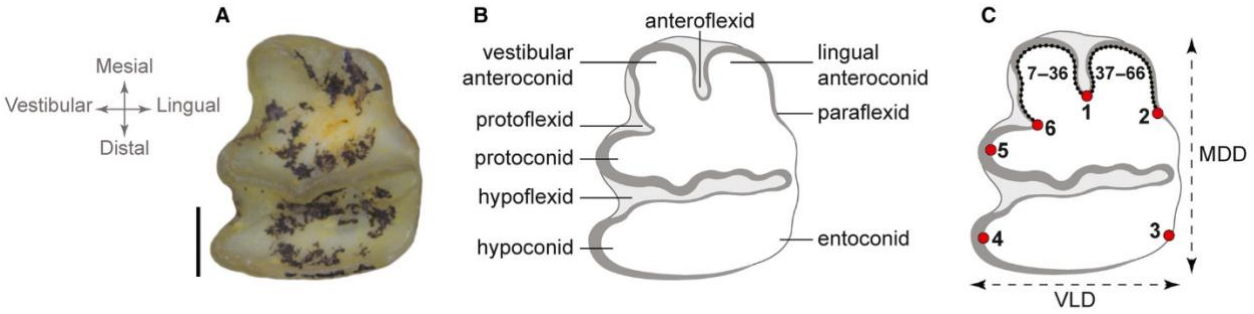

Figure 1. A, left p3 of rabbit in occlusal view. B–C, anatomical terminology (B) and linear measurements (C) (from Donard 1982), and the location of the six landmarks (red dots) and the 60 semi-landmarks (black dots): 1, anteroflexid; 2, paraflexid; 3, entoconid; 4, hypoconid; 5, protoconid; 6, protoflexid; 7–36, semi-landmarks situated between landmarks 6 and 1 (vestibular anteroconid outline); 37–66, semi-landmarks situated between landmarks 1 and 2 (lingual anteroconid outline) (source: Pelletier 2019). MDD, mesio-distal diameter; VLD, vestibulo-lingual diameter. Scale bar: 1 mm.

The findings have important implications for understanding the evolutionary history of rabbits and other small mammals. By demonstrating the combined impact of phylogeny, geography, and climate on dental morphology, the study highlights the complexity of evolutionary processes in early *Oryctolagus* species. Furthermore, it emphasizes the importance of integrating multiple analytical approaches to achieve a more comprehensive understanding of morphological evolution in fossil taxa. These insights contribute to refining the taxonomy of early Pleistocene rabbits and provide a foundation for future studies on the evolution and adaptation of small mammal species in response to past environmental changes.

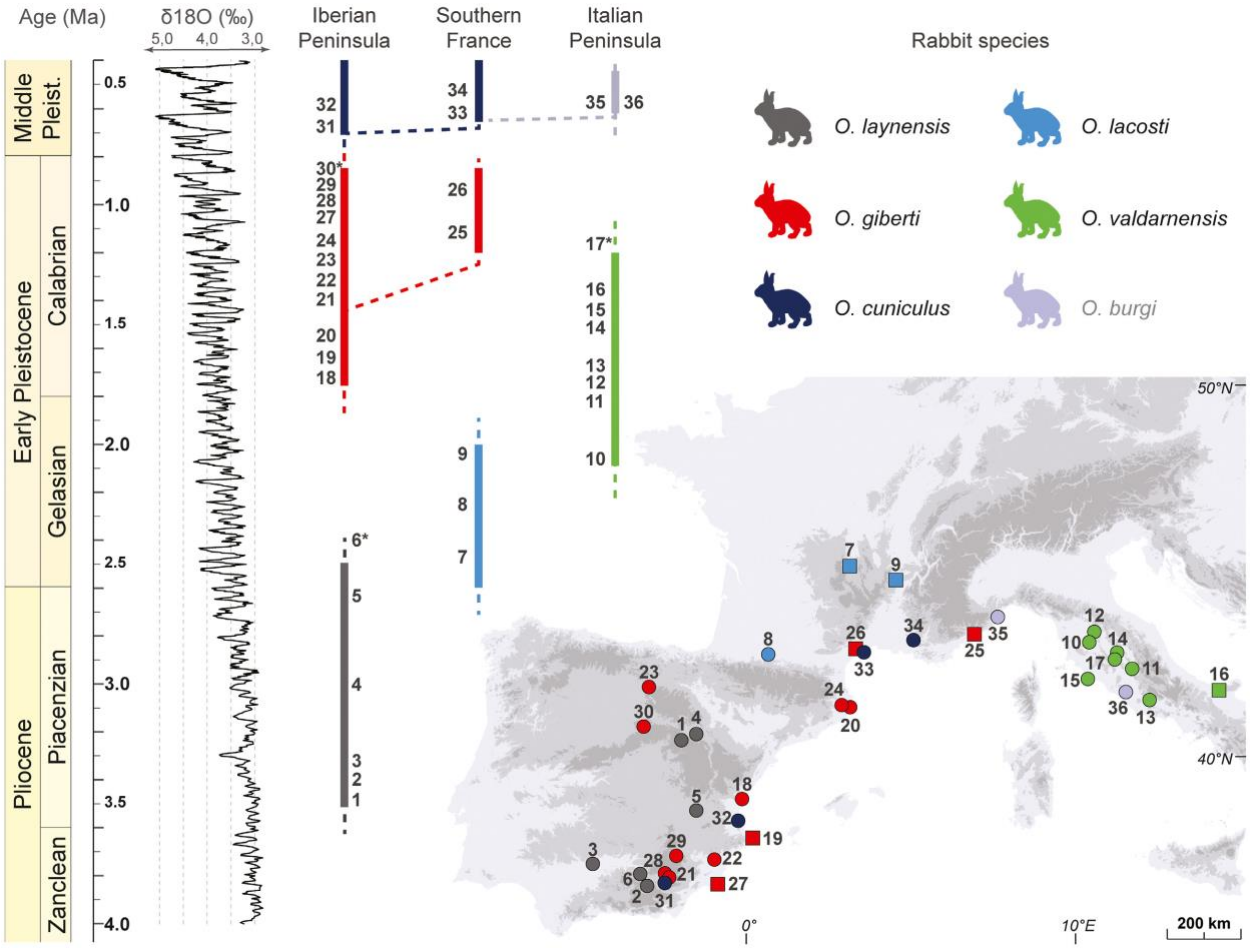

Figure 2. Palaeobiogeographic and temporal distribution of the genus *Oryctolagus* data in the late Pliocene and early–middle Pleistocene, based on published data (source: Pelletier 2021).

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