

3D models related to the publication: What Jaws and Teeth Reveal: Tracing Fine-Scale Ecological Adaptation in Two Cypriot Mice

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Abstract

This contribution contains 3D models of upper molar rows of Cypriot mice (*Mus cypriacus*) and house mice (*Mus musculus domesticus*) from the island of Cyprus. Although morphologically similar and occasionally syntopic, the two species differ in habitat use and dietary strategies, ranging from anthropogenic resources in *M. m. domesticus* to a more natural and diversified trophic niche in *M. cypriacus*. Mandibular and molar shape variation was quantified through 3D geometric morphometrics, enabling the detection of interspecific differences, allometric trends, and age-related dental wear trajectories. The morphometric descriptors were evaluated for their capacity to capture phylogenetic divergence, ecological specialization, and ontogenetic dynamics. Results highlight that subtle morphological signals can expose fine-scale ecological processes and species-specific adaptive strategies.

Keywords: Cyprus endemics, mastication, *Mus cypriacus*, *Mus musculus domesticus*, occlusal relief

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INTRODUCTION

The European house mouse (*Mus musculus domesticus*) is linked to humans since before the Neolithic. Its unintentional spread through human movements made it among the most successful invaders worldwide (Weissbrod et al., 2017). Anatomical study of its feeding apparatus (mostly jaws and teeth) delivered insights into its remarkable adaptability (Anderson et al., 2014; Renaud et al., 2024c). On Cyprus, two mouse species coexist: the introduced house mouse, associated with human-disturbed habitats, and the endemic Cypriot mouse (*Mus cypriacus*), which occupies more natural and cultivated areas at moderate altitudes. These species diverged over 2 million years ago, with *M. cypriacus* surviving Mediterranean island anthropization and showing subtle ecological niche partitioning reflected in mandible differences and dietary habits revealed by isotopic analysis (Hardouin et al., 2024; Renaud et al., 2024b). The comparison of their trajectories of mandible ontogeny and wear-related molar shape changes constitutes a step forward regarding the understanding of their local adaptation and questioning the morphological descriptors of anatomical differences (Dubied et al., 2026). Mandible and molar shape were described using 3D geometric morphometrics. The length of the anterior root of the first upper molar (UM1) was investigated as a potential tracer of age. Based on these descriptors, several topics are addressed. (1) Their respective adequacy to trace phylogenetic divergence and/or adjustment to food resources is first questioned. (2) Different markers of age-related dynamics are investigated and compared. (3) Allometry in mandible shape and age-related dynamics of wear in molars are investigated, in order to characterize possible fine tuning related to ecological differences. The

final aim is to question the ability of these anatomical descriptors to trace processes occurring at an ecological scale, and to compare them between species. 3D models of the mandibles have been deposited in a former contribution (Renaud et al., 2024a). The present contribution includes 3D models of the upper molar row (UMR) of five *Mus cypriacus* and five *Mus musculus domesticus* from Cyprus (Table 1), documenting the inter-specific difference in molar shape, as well as the modulation of the age-related trajectory of molar wear, due to subtle ecological differences (Figure 1).

METHODS

Mouse heads were scanned at a cubic voxel resolution of 12 µm on the General Electric (GE) Nanotom microtomograph (µCT) of the AniRA-ImmOs platform of the SFR Biosciences, Ecole Normale Supérieure (Lyon, France). The scanning parameters were as follows: 100 kV, 70µA, 3000 projections at 360° with Cu filter. For each mouse, the right mandible (or occasionally the left mandible) was manually segmented, including the molar row and the incisor, using the software Avizo (v. 9.1, Thermo Fisher Scientific). The 3D surfaces are provided in .ply format (see table 1) and can therefore be opened with a wide range of freeware.

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Inv nr.	Species	Location	Latitude	Longitude	Sex	Lroot1
APO1	<i>cypricus</i>	Nearby Temple of Apollo Hylates	34.67	32.88	male	0.98
BET2	<i>cypricus</i>	Nearby Methikoloni	33.06	34.75	male	0.85
FON1	<i>cypricus</i>	Foinikaria	33.09	34.74	male	1.19
FON2	<i>cypricus</i>	Foinikaria	33.09	34.74	male	0.94
KOU1	<i>cypricus</i>	Kourion	32.88	34.66	male	1.06
KOF1	<i>domesticus</i>	Kofinou	33.40	34.82		1.06
LEF1	<i>domesticus</i>	Lefkara	33.34	34.84	female	1.17
MEN1	<i>domesticus</i>	Meneou	33.59	34.85	male	0.92
TSE2	<i>domesticus</i>	Tseri	33.32	35.05	female	1.01
XYL5	<i>domesticus</i>	Xylophagou	33.83	34.97	male	0.99

Table 1. Label, species, location of trapping, sex and length of the anterior UM1 root (Lroot1) [mm] of the deposited specimens. Collection: LBBE, Villeurbanne, France.

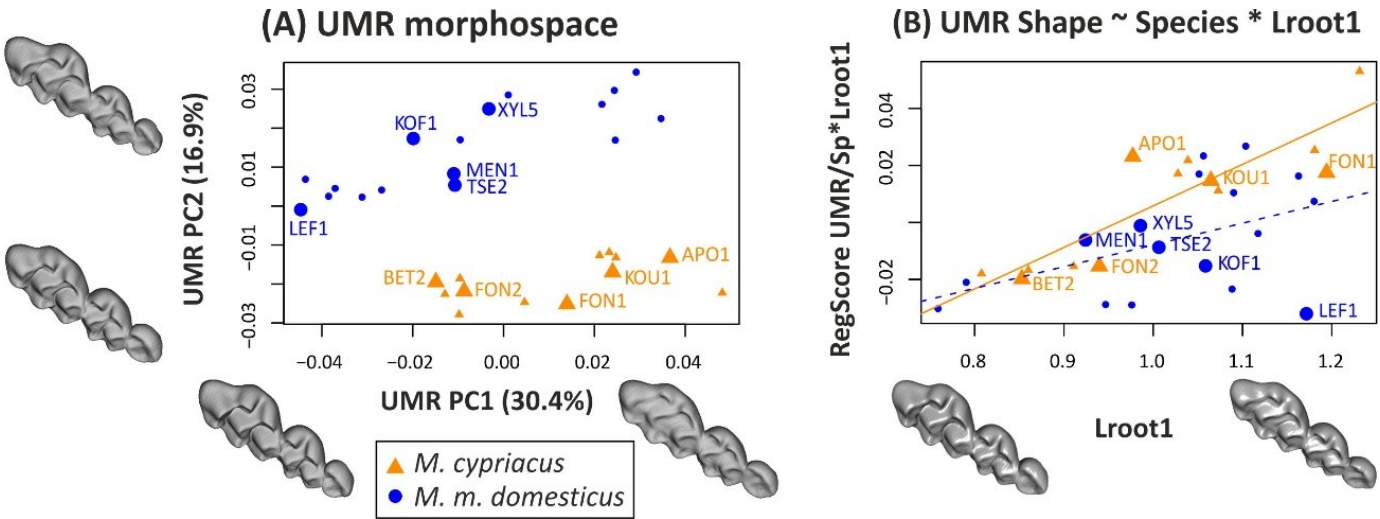


Figure 1. Morphospace and age-related variation of the upper molar row (UMR) in the two species of mice coexisting on Cyprus, *Mus cypricus* and *Mus musculus domesticus*. (A) Morphospace depicting the variation in molar row geometry, based on a surfacic approach. The first two axes of a PCA on the aligned coordinates are represented. (B) Shape of the upper molar row as a function of the length of the first upper molar anterior root (Lroot1), estimated by the regression score including species differences. Full line: significant within species relationship (p-value < 0.05); dotted lines: relationships close to the significant threshold (0.1 < p-value < 0.05). Visualizations correspond to minimum and maximum scores. The deposited specimens are mentioned on the plots with enlarged symbols and their label close to the symbol.

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