

What do cenograms tell us about the mammalian palaeoecology? The example of Plio-Pleistocene Italian faunas

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Past climatic and biotic change can only be thoroughly understood by studying ancient ecosystems. “Cenogram” analysis is one macroecological model for palaeoenvironmental reconstruction. A cenogram is a graphic representation of the rank-size distribution of non-volant mammal species within an ecologically cohesive fauna. Using data from modern faunas, cenogram analyses correlate characteristics of faunal body-mass distribution in mammalian faunas with habitat and environmental attributes. Cenograms were first employed by VALVERDE (1964) to study the relationships between the size of predators and that of their prey. Cenogram analyses are widely used at present for interpreting environmental parameters in northern hemisphere palaeofaunas: Cretaceous to Pleistocene assemblages of mid-latitude North America and Europe (see e.g. ALROY 1998; LEGENDRE 1986; MONTUIRE 1998, 1999; RODRIGUEZ 1999); Pleistocene subarctic and arctic (STORER 2003) and South American Cenozoic (CROFT 2002). Nonetheless, there is disagreement on the actual value of cenograms in reconstructing environments, as well as on the most appropriate methodological approaches.

To investigate the usefulness of cenograms

in inferring palaeoenvironmental conditions from mammalian fossil assemblages, we have analysed several Italian local faunal assemblages (from Villafranchian to Early Aurelian Mammal Ages, MAs). We then performed a cenogram analysis on the species inventory of each faunal unit (F.U.). We assumed that using F.U. results would be representative of trends in environmental changes during the Plio-Pleistocene, taken as an average for the whole geographical area of the Italian Peninsula. The body mass of each taxon was calculated using the most appropriate method as tested on samples of the most closely related extant species.

Using cenograms calculated for mammal faunas from the early Villafranchian (Middle Pliocene) to the early Aurelian MAs (late Middle Pleistocene), the progressive transition from humid/tropical woodlands (Early Villafranchian) to open/arid habitats (Early and Middle Galerian) to relatively humid woodland environments (Early Galerian), already suggested by floral and faunal data, was confirmed. Moreover, it seems that, over the course of time, more arid environments characterised the north-eastern and Apennine regions, whereas along the Tyrrhenian coast, more humid, temperate conditions prevailed.

ALROY, J. (1998): Cenogram Statistics: What Do They Tell Us About The Evolution Of Body Mass? – http://www.nceas.ucsb.edu/~alroy/JA_abstracts.html

CROFT, D.A. (2002): Body size distributions of Middle Cenozoic South American mammal faunas. – Programa y Resúmenes, Primero Congreso Internacional de Evolución Neotropical del Cenozoico, La Paz, Bolivia.: 19; La Paz. <http://home.uchicago.edu/~dacroft/Research/Publications/CroftBolivia1999.pdf>

LEGENDRE, S. (1986): Analysis of mammalian communities from the Late Eocene and Oligocene of Southern France. – *Palaeovertebrata*, **16** 4: 191-192, Montpellier.

MONTUIRE, S. (1998): Analyse paléocologique d'une première séquence de faunes de mammifères et evolution de l'environnements en Allemagne au Pleistocene. – *Compt. Rend. Acad. Sci., Sci. Terre planet.*, **326**: 221-226; Paris.

MONTUIRE, S. (1999): Mammalian faunas as indicators of environmental and climatic changes in Spain during the Pliocene-Quaternary transition. – *Quatern. Res.*, **52**: 129-137; Washington.

- RODRÍGUEZ, J. (1999): Use of Cenograms in Mammalian Palaeoecology. A critical review. – *Lethaia* **32**: 331-347; Oslo.
- STORER, J.E. (2003): Environments of Pleistocene Beringia: analysis of faunal composition using cenograms – *Deinsea*, **9**: 405-414; Rotterdam.
- VALVERDE, J.A. (1964): Remarques sur la structures et l'évolution des communautés de Vertébrés terrestres. I. structure d'une communauté. II. Rapport entre prédateurs et proie. – *Terre et Vie*, **111**: 1-129; Paris.