PALEONTOLOGIA I EVOLUCIÓ, memòria especial nº3 (2009), p. 41-42

Landmark-based morphometrics of micromammal mandibles and the effects of phylogeny and function: preliminary results

Isaac CASANOVAS-VILAR[1] & Jan VAN DAM[2]

Ecomorphology of fossil small mammals has traditionally centered on the interpretation of the dentition. Although fossil mandibles also carry important paleoecological information, until now they have been hardly used in paleoecology. Using fossil mandibles for ecomorphological " approaches" appears to be hampered by 1) their absence or sometimes fragmentary condition, 2) a lack of a database of extant shapes with known diets to compare with.

Geometric morphometric data of mammalian mandibles have started to be compiled for some extant families and for lower rank taxonomic groups (e.g. MICHAUX *et al*., 2007; CHRISTIANSEN, 2008). Nonetheless, comparative studies across higher taxonomic ranks such as orders or families are still very rare (e.g. MARCUS *et al*., 2000). Here we use a 2D geometric morphometrics approach to analyze a taxonomically broad sample encompassing a wide array of mandibles of extant species. The sample comprises mandible data from the orders Rodentia, Lipotyphla and Lagomorpha, as well as of some small carnivores (Carnivora). The aim is to detect whether there is any dietary and/or behavioral signal, and to analyze if this is related, and how,to convergences in mandibular shape. We selected 67 species each of which is represented by three specimens. The mandibles were photographed in standardized buccal view. A series of 15 landmarks were defined on this side of the mandible. However, the mandible is outlined by many smooth surfaces making it difficult to acquire a reasonable amount of type 1 landmarks (BOOKSTEIN, 1991). Thus, most of the configuration contains type 2 landmarks. Shape was analyzed by applying Generalized Least Squares Procrustes superimposition (ROHLF & SLICE, 1990). The correlation of shape with size is tested regressing the full set of partial warps on the natural logarithm of centroid size. Relative Warps analysis (including the uniform component) as well as Canonical Variates analysis are used to explore both the major shape differences across our sample, and the association between shape and functional groups. The results are discussed in the light of the *a priori* classifica-

1. Institut Català de Paleontologia (ICP), Campus de la UAB, Mòdul ICP, E-08193 Cerdanyola del Vallès, Spain. isaac.casanovas@icp.cat, jan.vandam@icp.cat

tions of all species in terms of their phylogenetic positions and dietary and behavioural specializations based on literature sources.

REFERENCES

BOOKSTEIN, F.L. (1991). *Morphometric tools for landmark data: Geometry and Biology*. Cambridge University Press, Cambridge, Massachusetts.

CHRISTIANSEN, P. (2008). Evolution of skull and mandible shape in cats (Carnivora: Felidae). *PlosOne*, 3 (7): e2807.

MARCUS, L.F., HINGST-ZAHER, E. & ZAHER, H. (2000). Application of landmark morphometrics to skulls representing the orders of living mammals. *Hystrix Italian Journal of Mammalogy*, 11: 27-47.

MICHAUX, J., CHEVRET, P. & RENAUD, S. (2007). Morphological diversity of old world rats and mice (Rodentia, Muridae) mandible in relation with phylogeny and adaptation. *Journal of Zoological Systematics and Evolutionary Research*, 45: 263–279.

ROHLF, F.J. & SLICE, D.E. (1990). Extensions of the Procrustes method for the optimal superimposition of landmarks. *Systematic Zoology*, 39: 40-59.