

Incisor morphology reflects diet in caviomorph rodents

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Rodents are important components of most modern ecosystems. Understanding their roles in paleocommunities requires robust methods for inferring diet and other autecological characteristics. This pilot study tests whether a relationship between incisor morphology and diet exists among extant rodents that might be used to infer diets of extinct species. We focused on 11 genera of caviomorph rodents classified in 3 dietary categories: fruit–leaf, fruit–seed, and grass–leaf. For each genus 6 variables describing morphology of the upper incisor were measured on 5 specimens. Data were analyzed using a series of stepwise discriminant analyses. Discriminant analyses correctly predicted diets of nearly all training cases (~95%) using 4 incisor characteristics. Five additional species (1 caviomorph and 4 noncaviomorph), treated as unknowns, also were classified correctly. Jackknife analyses correctly predicted diets of approximately two-thirds of training cases. Our study indicates that incisor morphology is related to diet in extant caviomorph rodents. Incisor data therefore might be useful for inferring diets of extinct species.

Key words: dentition, discriminant analysis, ecomorphology, herbivory, hystricognath, paleoecology, South America

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All modern rodents possess a pair of hypselodont, chisel-like incisors in the upper and lower jaws (Landry 1999; Meng and Wyss 2005; Van Valen 2004). These enlarged teeth arguably are the most easily recognized characteristic of rodents, and it is for these gnawing teeth that rodents are named (from the Latin *rodere*, meaning to gnaw). In addition to their obvious role in food acquisition and processing, these gnawing incisors are used by some species for digging, defense, or cutting tough materials such as wood (Nowak 1999). Relative to their morphological prominence and functional importance in rodents, rodent incisors have been the focus of surprisingly little ecomorphological investigation. Most recent studies that have examined rodent incisors in an ecological context have attempted to correlate their morphology with digging behavior rather than diet (e.g., Fernández et al. 2000; Hopkins and Davis 2009; Millien and Jaeger 2001; Millien-Parra 2000; Mora et al. 2003; Rybczynski 1999). Other studies have focused on size evolution and guild partitioning among a small number of sympatric species using incisor data and have demonstrated character displacement indicative of dietary resource partitioning (Ben-Moshe et al. 2001; Dayan and Simberloff 1994; Parra et al. 1999). Although a recent study by Samuels (2009) explored how cranial morphology differs among major dietary categories of rodents (e.g., carnivores, generalist herbivores, and omni-

vores), no study yet has focused solely on the relationship between incisor morphology and diet in rodents nor attempted to discriminate among herbivore diets at a finer scale.

The aim of our pilot study is to test whether a relationship between incisor morphology and diet exists among primarily herbivorous rodents. We do so by focusing on a morphologically diverse yet taxonomically limited group of rodents, the South American caviomorphs. In addition to exploring relationships that might provide insights into modern rodent ecomorphology, our ultimate goal is to determine features that can be used to infer diets of extinct species, especially those of the Tertiary of South America.

Caviomorphs are a monophyletic group of hystricognathous rodents that include 231 extant species in 11 families (Huchon and Douzery 2001; Woods and Kilpatrick 2005). They originated in South America prior to the earliest Oligocene, potentially as early as 50 million years ago (Flynn and Wyss 1998; Flynn et al. 2003; Rowe et al. 2010; Wyss et al. 1993, 1994), and quickly became prominent components of South American mammalian paleocommunities (Marshall and Cifelli 1990; Pascual and Ortiz Jaureguizar 1990; Patterson and

