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A cenogram is a rank-ordered body size distribution of non-predatory mammal species within a community. Studies of cenograms for modern faunas have shown that certain quantifiable attributes of cenograms are correlated with environmental variables such as rainfall and vegetational structure. Based on these correlations, cenograms of fossil communities have been used to infer paleoenvironments and paleoenvironmental variables. The present study uses cenogram statistics to interpret paleoenvironmental conditions for a variety of Cenozoic South American mammal faunas. Community data from eight distinct fossil assemblages are included in the analysis. These assemblages range from Eocene to Pleistocene in age. Body sizes for fossil taxa are either taken from the literature or are calculated using regressions of molar length or femoral bicondylar width on body size for modern mammals. Cenogram statistics are calculated for the eight fossil faunas and compared to similar statistics calculated for 16 modern South American mammal faunas, allowing paleoenvironmental interpretations to be made. The paleoenvironmental interpretations based on cenogram analyses sometimes support and sometimes contradict published interpretations based on herbivore craniodental morphology (i.e. hypsodonty levels). Simulations of expected errors in body size estimates for fossil taxa do not suggest that the discrepancies primarily result from erroneous body size estimates. It is possible that some of the incongruity in interpretations results from certain non-analog attributes of South American faunas during much of the Cenozoic (e.g. the relatively depauperate mammalian predator diversity prior to the Great American Biotic Interchange).