

ABSTRACT

Studying patterns of diversity and demarcating species in the paleontological context is problematic because fossil remains are fragmentary and samples are typically limited. In contrast, extant species can be potentially diagnosed using several types of data. Yet the assumption is that fossil species are equivalent to modern species. In this thesis I argue that if fossil and modern species are equivalent concepts, then patterns of variation in modern species should provide models that can be used to understand the nature of diversity in fossil forms and help delineate fossil species.

I document patterns of dental variation in *Pan* and *Gorilla* in a nested hierarchy from population to species. The following questions are addressed: (1) what dental characters can be used to differentiate the African apes at subsequently higher taxonomic levels? (2) How do patterns of variation using dental data compare with those based on other types of data? (3) How do adaptive strategies and phylogenetic history influence patterns of variation? These questions help to assess the utility of (1) dental material for recognizing species, and (2) extant species as models for discriminating fossil species.

341 chimpanzees and 299 gorillas were sorted into 16 and 14 populations, respectively, and about 400 dental traits were studied on each individual.

Univariate and multivariate statistical techniques were used to analyze the data.

Results indicate that patterns of variation based on dental data match those based on other types of data, confirming the usefulness of dental data for recognizing species. However, patterns of dental variation differ markedly in *Pan* and *Gorilla*, being reflective of their adaptive strategies and unique evolutionary history. This signals the use of caution when applying models based on extant taxa for discriminating fossil species. Taxa that are phylogenetically related serve as better models, but it is advisable to draw common patterns from several taxa when developing models.

Finally, the patterns of variation in incisor morphology in all modern hominoid genera are applied to assessing the utility of lingual incisor morphology for discriminating species of Miocene apes. Based on this study suggestions are made regarding the taxonomy of some Miocene hominoid species.