

FIVE MILLION YEARS OF EVOLUTION IN A LATE CENOZOIC MAMMALIAN PREDATOR GUILD

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Coexistence among large mammalian predators is not always or even typically easy. Not only do they compete for the same resource but they also must avoid predation. Larger predators kill smaller ones and the young of all species are vulnerable. In addition, the prey of the largest predators, ungulates, is difficult to acquire and carcasses often must be defended from thieves. In the Serengeti, one of the best studied terrestrial ecosystems extant, it appears likely that the populations of most predator species are regulated largely by the distribution and abundance of the two dominant species, the lion and spotted hyena, rather than prey availability. Given this high degree of ecological interaction, communities or guilds of mammalian predators are likely to be limited in species richness and well-structured to minimize ecological overlap. Previous work on predator and prey species diversity over the Cenozoic revealed a dampened variation in predator diversity relative to prey diversity, suggesting a tighter ceiling on predator species richness. Over evolutionary time, sympatric suites of mammalian predators are expected to be stable in number and the array of ecomorphs. Extinction of a particular species is likely to result in its replacement by a similar form. If species richness increases with time, the new taxa should be added at the perimeter of the morphospace defined by the resident species. To test these ideas, a five million year history of Florida mammals is examined. The time span ranges from the Late Hemphillian (approximately 4-5 ma) to the late Rancholabrean (0.1-0.01 ma), and is represented by seven fossil localities or seven paleoguilds. Dental measurements that reflect diet (e.g. bone-cracker, hypercarnivore, omnivore) are used to characterize each of the fossil species and these data are used to construct a multidimensional morphospace. Different regions within the dental morphospace define distinct dietary types or ecomorphs and consequently the distribution of species of a paleoguild within the morphospace provides a graphic representation of ecological diversity at a given time. Moreover, the degree of species packing and possible ecological overlap within a paleoguild can be estimated by measures of nearest neighbor distance. These estimates of paleoguild shape and size are examined for the seven sequential Florida paleoguilds. Over the span of five million years, species richness within the guild ranges from eight to 11, and there are numerous extinctions with replacement. Thus the Florida sequence provides a good test of the existence of stability of ecological structure despite taxonomic turnover.