

Dietary niche shifts are coincident with mammalian body size reduction during a Paleocene hyperthermal

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The idea that ecological niches remain stable during periods of rapid climate change has long been central to methods used to assess extinction risk. However, evidence to test this assumption, particularly beyond recent timescales, remains scarce. Here we examine how a terrestrial mammal responded to rapid climate warming during the Latest Danian Event (LDE; ~62.3 Ma) in the early Paleocene. *Tetraclaenodon puerensis* is an archaic ungulate that exhibits a size reduction during the LDE in the San Juan Basin of New Mexico, USA. The drivers of this phenomenon – hyperthermal dwarfism – remain poorly resolved and are often linked to biogeographic range shifts rather than in situ ecological responses. Using a novel multi-comparator approach to dental microwear texture analysis, we show that *T. puerensis* shifted from frugivorous to folivorous diets during the LDE. Such a shift is often observed among extant forest mammals during times of food scarcity and moisture stress, which are likely during Palaeogene hyperthermals. Our results provide the first robust evidence for mammalian ecological responses and adaptation to lower quality resources during a Palaeogene hyperthermal. Dietary niche shifts therefore provide a means of dealing with rapid warming without requiring broad changes in biogeographic ranges.