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DIETARY ECOMORPHOLOGY OF DIRE WOLVES FROM THE MCKITTRICK ASPHALT SEEPS, SOUTHERN CALIFORNIA, U.S.A.

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Dire wolves (*Aenocyon* [formerly *Canis*] *dirus*) were apex predators of the Pleistocene epoch but went extinct ca. 11,700 years ago. The causes and consequences of their extinction are well studied at the Rancho La Brea (RLB) asphalt seeps in Los Angeles, California, U.S.A., but remain to be evaluated at other late Pleistocene sites with differing ecological and environmental contexts. Here, we analyze the dietary ecomorphology of dire wolves from the Pleistocene-age McKittrick asphalt seeps on the southern end of the Central Valley of California, 200 km northwest of RLB. While we expected all dire wolves to display traits for specialized feeding behavior like bone-cracking, we hypothesized that differences in faunal composition and/or environment between McKittrick and RLB would produce differences in dire wolf diet across the two sites. For instance, RLB dire wolves—having more prey options near the coast, including marine resources—might have traits maximizing dietary variability, like retaining tooth areas for both slicing meat and crushing bone, as opposed to McKittrick inland. We examined McKittrick dire wolves (89 specimens of lower jaws and teeth) at the University of California Museum of Paleontology, Berkeley, comparing them with RLB dire wolf lower jaws (n = 45) at the La Brea Tar Pits & Museum, Los Angeles. Using calipers, we collected 15 measurements of the jaws and teeth, combining six of them into three indices of dietary function: relative blade length (carnivory or slicing ability), relative lower molar grinding area (cracking or crushing ability), and relative jaw depth (jaw robustness). Our raw measurements did not differ between the two RLB deposits sampled (Pits 3/4 and 13); therefore, we combined all RLB dire wolves and compared them as one category to McKittrick. Using Wilcoxon rank-sum tests, we found that dire wolves were generally larger at McKittrick than at RLB: McKittrick dire wolves had longer (but not wider) lower fourth premolars and second molars, longer and wider carnassials, and dorsoventrally deeper jaws. However, functional indices differ little between McKittrick and RLB: controlling for size, the ability of McKittrick dire wolves to slice meat or crack bone was on par with RLB dire wolves. Regardless, the larger absolute size of McKittrick dire wolf jaws and teeth suggests that they could specialize on larger prey than at RLB—although common prey at McKittrick (e.g., horse, llama) tended to be smaller than at RLB (e.g., bison, camel). Alternatively, larger dire wolf size at McKittrick may relate to local climate factors; while previous work has reconstructed greater aridity at McKittrick than today, temperature proxies currently in progress should aid in testing this hypothesis in the future. Furthermore, as the McKittrick specimens measured here were quite fragmentary, our work continues to supplement the current sample with additional specimens to improve understanding of predator diet.

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