Diets of Commensal Roof Rats (*Rattus rattus*) in California (Abstract)

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ABSTRACT: Roof rats (*Rattus rattus*) are a successful invasive species worldwide because of their ability to exploit their commensal relationship with humans. They are opportunistic feeders that use a wide range of natural and anthropogenic food sources. Because some rodent control methods, such as traps and rodenticides, threaten non-target wildlife species, understanding the diets of roof rats can help develop targeted approaches to better control these pests. Our aim is to use stable isotope analysis and stomach contents analysis to determine the diets of roof rats collected in agricultural, urban, and suburban areas in California. We hypothesized that diets of roof rats trapped in agricultural areas would contain crop plants and food resources associated with the agricultural environment (arthropods, mollusks), whereas those from urban and suburban areas, e.g., schools, residential zones, would consume a broader range of food sources, including anthropogenic foods such as pet food, trash, and produce from gardens and fruit trees.

To date, we have obtained roof rat carcasses from control efforts across the state, including our own trapping in southern California. Rats were frozen until they could be dissected in the lab. From each rat, we removed the gastrointestinal tract and took a small sample of ear tissue for stable isotope analysis; all tissues were stored in 95% ethanol. Ear tissue samples were dried, cut into small pieces, and weighed before sending them to the UC Davis Stable Isotope Facility for stable carbon (C) and nitrogen (N) isotope analysis. Stomachs were dissected under a dissecting microscope and food items were identified using reference keys.

Preliminary analyses of stomach contents revealed significant amounts of what appears to be plant material, seeds, arthropod parts, and rodenticide bait, as well as many roundworms. Isotopic analysis of ear tissue of 64 rats from four Central Valley counties and urban/suburban rats from three southern California counties (n = 65) and Yolo County (n = 14) showed that $\delta^{13}C$ values of rats from urban settings were significantly enriched compared to rural rats (Figure 1; F = 4.52, d.f. = 1, 141, P = 0.053), which is consistent with an urban diet containing more anthropogenic foods. $\delta^{13}C$ values of urban roof rats were also much more variable (coefficient-of-variation, CV = 8.7%) than that of rats from agricultural areas (CV = 3.6%), which showed remarkably little variation within a site, indicative of feeding on a concentrated, shared resource. $\delta^{15}N$ of rats differed significantly between agricultural counties (F = 195.9, d.f. = 3, 60, P <0.0001), as well as between urban rats from Yolo County and southern California (F = 10.87, d.f. = 1, 77, P = 0.0015). Mean $\delta^{15}N$ of rats from Kings and Yolo counties was 6.1‰ lower than that in Kern and Tulare counties (Figure 1), suggesting that Kings and Yolo County rats consume a mostly plant-based diet, whereas those from Kern and Tulare either consume more animal-based material or, possibly, feed on a food source that is enriched in heavy-nitrogen, e.g., fertilizer. We do not yet have sufficient samples of potential prey to identify what these rats might be eating or to estimate contributions of different food types to diet using a stable isotope mixing model, which is our ultimate aim.

KEY WORDS: agriculture, commensal, diet, food habits, *Rattus rattus*, roof rat, stable isotope analysis, suburban, urban

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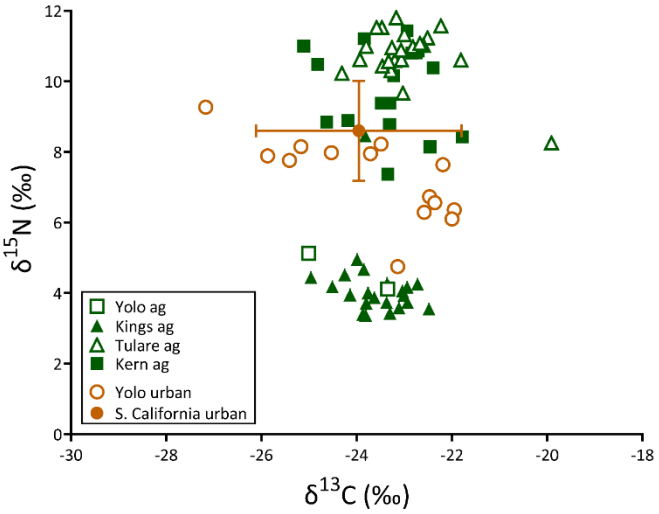

Figure 1. Stable carbon and nitrogen isotope values of roof rats (*Rattus rattus*) collected in rural agricultural ("ag") and urban/suburban ("urban") areas of California counties. Counties: Kern, Kings, Tulare, Yolo, southern California (Los Angeles, Orange, San Diego). For clarity, southern California values are shown as the mean (± SD, n = 65).

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