

Dietary Variation Is Driven by Landscape Heterogeneity in an Insular Omnivorous Endemic Lizard, Revealed by DNA Metabarcoding

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Abstract:

Living on islands entails numerous challenges for animals, among which population density approaching the carrying capacity of trophic resources stands out. To overcome this limitation, many insular lizards can supplement their insectivorous diet with increasing portions of plant material. The Madeira wall lizard, *Teira dugesii*, is a medium-sized lacertid, endemic to the Madeira and Selvagens archipelagos. As common in this family, adults are sexually dimorphic with males being bigger than females. Previous dietary studies on morphological scatology identified a higher proportion of plant over animal prey items, changing according to the location and sex. Here, we used DNA metabarcoding to examine the diet of this lizard species quantifying it at a higher taxonomical resolution and enhancing the detection of softbody prey that often go undetected in morphology based studies. In a sample of 151 faecal samples from eight populations including different habitats and altitudes in Madeira, we identified 289 prey items belonging to eight animal and three plant Classes, encompassing 58 distinct orders and 140 families. Of these, 63 were identified up to the species level. The results support a strong trend towards herbivory in this species with plants representing almost 74% of the diet occurrences in contrast to the 26% of animal prey. Remarkably, the plant fraction of the diet remained stable across localities but varied with size and mass in males. As males grew bigger and heavier, they significantly increased their plant matter intake. Likely, larger bodies and abdomens allowed allocating longer and more complex digestive tracts harbouring intestinal flora to better decompose plant organic compounds. This allowed heavier animals to have a richer diet regime. However, diet richness and composition were not affected by either sex or size, while the locality had a significant effect on both diet components likely in response to local variation in prey availability. By including an increasing plant fraction into a primarily insectivorous diet, this insular lizard has not only enlarged its trophic niche but is also able to exploit more efficiently the highly variable resources provided by insular environments.