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Climate warming expected to alter thermal performance and trigger range shift in outbreaking South American locusts

Ecologists use correlative models to predict how species distributions will respond to environmental change, but these models are unreliable when extrapolating to future environments. To minimize extrapolation, modelers should use mechanistic predictors that reflect range-limiting processes. As generalist herbivores with abundant food, locusts may be limited by thermal effects on digestion. We measured thermal effects on the consumption and defecation of South American locusts (Schistocerca cancellata), and we used these data to project performance in current and future climates. We then integrated the performance projections into species distribution models to predict the distribution of outbreaking locusts based on different predictor sets, modelling methods, and climate scenarios. Contrary to expectations, models with only mechanistic predictors performed worse than those with only macroclimatic predictors; however, the best models were those that used both predictor types. Based on the mechanistic model, these locusts should occur throughout tropical S. America, but species distribution modelling revealed they are restricted to temperate regions. This mismatch between the mechanistic model and the distribution of S. cancellata suggests that the northern range of this species is limited by some factor other than temperature. All models projected that locusts would shift to higher latitudes and altitudes in response to climate warming, with the magnitude of this shift proportional to the amount of warming. Consequently, agriculturists should consider enhanced monitoring and management near the southern range of this species. Partially supported by NSF IOS 1826848.

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Effects of captivity on the bone microstructure of xenarthrous vertebrae

Captive specimens in natural history collections allow researchers to inspect the morphologies of rare taxa, but the lifestyles, diets, and lifespans of captive animals differ from those of their wild counterparts. To quantify these differences, we compared bone microstructure of trunk vertebrae in captive and wild xenarthran mammals (sloths, armadillos, anteaters). Because trabecular bone architecture (TBA) adapts to in vivo forces, bone microstructure reflects ecology and behavior, but this means that it may differ between captive and wild specimens of the same species. We collected μCT scans of the last six presacral vertebrae in 13 species of fossorial, terrestrial, and suspensorial xenarthrans ranging in body mass from 120g (*Chlamyphorus*) to 35kg (*Myrmecophaga*). For each vertebra, we measured bone volume fraction (BVF); trabecular number, mean thickness (TbTh), and orientation; global compactness; and cross sectional area. Wild specimens generally have more robust trabeculae, but this differs based on species, vertebral position, ecology, and pathology. The wild specimens of fossorial taxa (*Dasypus*) have more robust trabeculae than their captive counterparts, but there is no clear difference in TBA of wild and captive specimens in suspensorial and terrestrial taxa (*Bradypus*, *Choloepus*, *Cyclopes*). These data suggest that locomotor ecology affects the level to which captivity affects bone microstructure. The captive specimens of both *Tamandua* and *Myrmecophaga* have higher BVF and TbTh than their wild counterparts, indicating more brittle trabeculae due to bone pathologies caused by captivity. Our results add to the overall understanding of variation in mammalian bone microstructure and suggest caution when including captive specimens in research on TBA.

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Age-related differences in core body temperature and oxidative stress under limited food availability

In endotherms, maintenance of constant body temperature can be challenging under limited food availability. Many birds may drop body temperature below normothermia during the night to decrease energy metabolism. Such rest-phase hypothermia may also affect the