1. An organism's adult body size impacts their ecological function and the ecosystem services they can provide. In dung beetles, the amount of dung buried increases with body size, which affects the benefits provided by this behavior such as soil nitrogen retention, greenhouse gas reduction, and parasite depletion. We examined the influence of air temperature, nutrient availability, presence and density of large mammalian grazers, and insecticide exposure on dung beetle body size in two species of dung beetle.
2. Dung beetles were collected using pitfall traps in the summer of 2022. Across the growing season we collected 18,068 specimens and measured 4,646 individuals of two common species of dung beetles found in northeastern Montana, USA: *Canthon pilularius*, a large native species, and *Onthophagus nuchicornis*, a smaller non-native species. Electronic calipers were used to measure the length of beetle horns (if present), forearms, head, thorax, and elytra.
3. Both species were the least common in areas treated with insecticides and in ungrazed areas. *O. nuchicornis* was especially more abundant on prairie dog towns. *C. pilularius* tended to have smaller body sizes with insecticide use, but non-significantly. Surprisingly, *C. pilularius* was smaller in bison and cattle units and in areas with more dung patties. Similarly, *O. nuchicornis* was smaller on prairie dog towns and in areas with more prairie dog dung present. In contrast, increases in browser dung (from deer and antelopes) paralleled increases in the body size of *C. pilularius*. Additionally, hotter temperatures within the 20 days prior to capture resulted in smaller individuals, especially of the native species, *C. pilularius*.
4. We find that warmer temperatures due to climate change could lead to smaller body sizes in dung beetle populations and thus, a reduction in the ecosystem services they provide. Additionally, we find that dung beetle species vary in their responses to large herbivores and dung availability with browsers being a potentially overlooked key resource for the most common native roller in our system. Understanding drivers of dung beetle populations and traits in rangelands will allow citizens and policymakers to make educated decisions on the preservation of these keystone decomposers and the benefits they offer to our food supply.
5. An organism's adult body size impacts their ecological function and the ecosystem services they can provide. In dung beetles, the amount of dung buried increases with body size, benefitting soil nitrogen retention, greenhouse gas reduction, and parasite depletion.
6. We examined drivers of body size in two species of dung beetle. We collected 18,068 specimens and measured 4,646 individuals of two common species of dung beetles found in northeastern Montana, USA: *Canthon pilularius*, a large native species, and *Onthophagus nuchicornis*, a smaller non-native species.
7. Both species were the least common in ungrazed and insecticide treated areas. *O. nuchicornis* was more abundant on prairie dog towns. *C. pilularius* tended to have smaller body sizes with insecticide use, but non-significantly. Hotter temperatures prior to capture resulted in smaller individuals, especially of the native species, *C. pilularius*. Surprisingly, *C. pilularius* was smaller in bison and cattle units and in areas with more dung patties. Similarly, *O. nuchicornis* was smaller on prairie dog towns and in areas with more prairie dog dung. In contrast, increases in browser dung (from deer and antelopes) paralleled increases in the body size of *C. pilularius*.
8. Decreases in dung beetle body sizes with rising temperatures could reduce the ecosystem services beetles provide. Dung beetle species varied in their responses to large herbivores with browser dung being a potentially overlooked resource. Understanding drivers of dung beetle populations and traits in rangelands informs conservation actions for these keystone decomposers.