

Plant and small-mammal responses to large-herbivore exclusion in an African savanna: five years of the UHURU experiment

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TYLER R. KARTZINEL,^{1,8} JACOB R. GOHEEN,^{2,3} GRACE K. CHARLES,^{2,4} ELYSE DEFranco,² JANET E. MACLEAN,⁵
TOBIAS O. OTIENO,⁶ TODD M. PALMER,^{2,7} AND ROBERT M. PRINGLE^{1,2}

¹*Department of Ecology and Evolutionary Biology, Princeton University, Princeton, New Jersey 08544-2016 USA*

²*Mpala Research Centre, Nanyuki 10400 Kenya*

³*Department of Zoology and Physiology, University of Wyoming, Laramie, Wyoming 82071 USA*

⁴*Department of Plant Sciences, University of California, Davis, California 95616 USA*

⁵*School of Biological Sciences, University of Aberdeen, Aberdeen AB24 2TZ United Kingdom*

⁶*Department of Wildlife Management, Moi University, Karatina, Kenya*

⁷*Department of Biology, University of Florida, Gainesville, Florida 32611 USA*

Abstract. Assessing the direct and indirect consequences of nonrandom species removal within guilds of strongly interacting species, such as large mammalian herbivores, is an important goal in basic and applied ecology. The ecological impacts of such perturbations are often contingent on abiotic conditions, which have hindered efforts to generalize the results of field experiments. Thus, there is a need for experiments that selectively remove different species from ecologically important guilds and that are replicated across environmental gradients. In 2008, we constructed a series of size-selective large-herbivore exclosures across a natural rainfall gradient in semi-arid Kenyan savanna. This experiment (“UHURU”, for ungulate herbivory under rainfall uncertainty) aims to (a) characterize the effects of successively removing the largest size classes of herbivores from the system and (b) evaluate how the direction and magnitude of these effects are shaped by variation in precipitation regimes. UHURU consists of three electrically fenced herbivore-exclusion treatments and an unfenced control, applied to blocks of contiguous 1-ha plots. The three fenced treatments are: “Mega” (exclusion of elephants and giraffes only); “Meso” (exclusion of both megaherbivores and mesoherbivores, ~40 kg and larger); and “Total” (exclusion of all herbivores ≥ 5 kg). Each block of treatments is replicated three times at each of three sites along the 20-km rainfall gradient (increasing from 439 mm/yr in the north to 639 mm/yr in the south, with little background variation in soil attributes and species composition). We present data, spanning 2008–2013, from (a) biannual surveys of understory plants at 49 staked grid points within each of the 36 1-ha plots (1764 total stakes); (b) annual woody-plant censuses within the central 0.36 ha of each plot; (c) annual and semi-annual monitoring of individually marked woody plants; (d) small-mammal capture–mark–recapture sessions conducted every other month in total-exclusion and open plots; (e) daily rainfall monitoring throughout the course of the experiment; and (f) quarterly large-mammal dung surveys.

Key words: *body size; climate; competition and facilitation; ecological field experiments; elephants; extinction; indirect species interactions; Kenya (East Africa); rodents; top-down control; ungulate herbivory.*

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