

Anthropogenic and climatic drivers of population densities in an African savanna ungulate community

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Abstract

Many ungulate species in Africa range in habitats that vary in type and quality over space and time, but ongoing environmental change is substantially altering their habitats. Identifying key environmental variables that regulate ungulate population densities can guide management actions for effective conservation. We studied the local population density responses of a community of sympatric ungulate species in the Tarangire Ecosystem of northern Tanzania, to a suite of environmental factors that vary over space and time, to quantify population trends, determine the primary environmental correlates of densities, and identify covariation in densities among species. We estimated seasonal densities of five commonly detected species (impala, dik-dik, Grant's gazelle, eland, and waterbuck) based on 7 years of distance-sampling data from 41 replicate surveys of 237 line transects. We systematically analyzed the effects of spatial, seasonal, and annual environmental covariates on variation in transect species-specific densities across space and time. Despite large fluctuations in climatic factors, we documented more spatial than temporal variation in four of the five species, suggesting that spatial heterogeneity may provide some buffer against temporal variation in the environment. Protection of sufficient habitats and water sources should allow ungulates to respond to a temporally changing world by moving across space. Further, among-species covariation patterns identified two potential ungulate guilds (impala—dik-dik—waterbuck; eland—grant's gazelle) that should aid in developing efficient and coordinated management actions.

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