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Fences Impede Long-distance Mongolian Gazelle (*Procapra gutturosa*) Movements in Drought-stricken Landscapes

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Abstract

Human-generated landscape barriers are especially problematic for species whose life histories entail long-distance movements. In May 2008, hundreds of Mongolian gazelles (*Procapra gutturosa*) became entangled in border fences as thousands attempted to move from Mongolia into Russia. Typically, the root cause of such (non-migratory) mass animal movements can only be superficially described. Here we draw upon satellite imagery and a fortuitously timed field study to investigate a likely hypothesis. At the same time that gazelles were attempting to cross from Mongolia into Russia, gazelles equipped with satellite-linked collars repeatedly attempted to emigrate from Mongolia into China. Satellite-derived estimates of vegetation productivity demonstrate that a decade-long decline in available green biomass in Mongolia's steppes underlies the gazelles' attempted mass emigrations. Given the potential that this trans-boundary movement event will occur within these drought-stricken landscapes in the future, modest fence modifications suitable for other similar open habitat ungulates may be sufficient to allow the gazelles to maintain their nomadic movements.

Key words: Mongolian gazelle, grassland, NDVI, habitat fragmentation, barrier, unsustainable development

Introduction

The impact of fencing on the ability of wildlife to access crucial habitat can have devastating affects and have the potential to severely reduce their numbers, prevent population recovery, and cause economic damage (Bies, 2007; Cohn, 2007; Harrington & Connover, 2006; Ringrose *et al*., 1997; Williamson & Mbano, 1983). Animal species whose life histories entail long-distance movements may be especially sensitive to habitat fragmentation and associated human-generated barriers to movement (Berger, 2004). Effective conservation of such species will require integrative approaches that blend science and public policy, such as a willingness to accommodate trans-boundary animal movements and extensive movements across a multi-use landscape (Bolger *et al*., 2008).

Mongolia's eastern steppes are one of the largest remaining temperate grasslands. Mongolian gazelles (*Procapra gutturosa*), which still persist in large numbers (~1 million individuals [Schaller, 1998, Olson *et al*., 2005]), are the dominant large wild herbivores inhabiting the steppe. These gazelles consistently exhibit long-distance, nomadic movements (our data indicate as much as 600 km from the farthest points in a 12-month period), which rank them among the top five most mobile ungulates (Berger, 2004).

In May 2008, scientists from World Wildlife Fund-Russia, WWF-Mongolia, and the Large Herbivore Foundation reported hundreds of dead Mongolian gazelles entangled in border fences along the Mongolian-Russian border and additional thousands of gazelles trapped between the border fences as they attempted to move from Mongolia into Russia (Large Herbivore Foundation, 2008; World Wildlife Fund, 2008). Attempts were made to facilitate crossing and prevent entanglement

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