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Evaluating wire-snare poaching trends and the impacts of by-catch on elephants and large carnivores

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ABSTRACT

Wire snare poaching is widespread in Africa yet snaring trends, patterns and the impacts of by-catch on non-target threatened species such as elephant (*Loxodonta africana*), lion (*Panthera leo*) and African wild dog (*Lycaon pictus*) are poorly understood. We conducted retrospective analyses of data from 1038 anti-poaching patrols conducted in Zambia's Luangwa valley from December 2005 to November 2010, to evaluate snaring dynamics and the effect of season, patrol size and length on snare detection. We also assessed impacts of by-catch on elephant, lion, and wild dog populations critical to the area's wildlife tourism-based economy. Snaring mortality increased overall elephant poaching offtake by 32%. Approximately 11.5% of the adult and subadult lion population and 20% of the adult (>4 years) males were snared. Snared dogs occurred in 67% of packs (n = 6), comprising 14–50% of adult and yearling pack members (median = 20%) and 6–16% of a resident population (median = 6%) already at minimum viable pack size (mean = 5.6). Evidence for seasonal and annual trends differed by patrol type, yet substantial evidence of positive interannual and seasonal trends in snaring existed and there was no evidence of a decreasing trend. Because patrols are intended to reduce poaching and enforcement is adaptive toward increasing snare detection, evaluations of snaring trends from patrol data are potentially confounded; thus we recommend that a portion of the overall patrol effort for anti-poaching should be devoted to non-adaptive surveys under fixed, well-designed protocols to enable unbiased tracking of snaring trends over time and objective evaluation of anti-poaching and community conservation efforts. In addition precautionary management emphasizing increased law enforcement is essential to protect existing wildlife-based economies and resources.

1. Introduction

As the global supply of natural resources is increasingly strained by rapid human population growth, the importance of reserves continues to grow given that they typically protect the greatest diversity and abundance of wildlife species while offering increased economic opportunities for the communities within and around them (Sinclair, 1998). However the relative availability of resources and economic opportunities has also resulted in comparatively high human concentrations on protected area borders (Metzger et al., 2010; Wittemyer et al., 2008). Such trends have led to negative impacts on wildlife, including increased human edge effects that in the extreme have led to species extinctions within the reserves themselves (Brashares et al., 2001; Harcourt et al., 2001; Woodroffe and Ginsberg, 1998).

One of the most important human effects has been the burgeoning bushmeat trade. Substantial attention has been paid to illegal and unsustainable harvest rates of wildlife species in Africa, where reserve edge effects are especially pronounced (Brashares et al., 2004; BCTF, 2005; Fa and Brown, 2009; Woodroffe and Ginsberg, 1998). With doubling of Africa's human population predicted by 2050 (UN-ESA, 2008), protein resources will be increasingly strained, promoting purchase and harvest of bushmeat for sustenance and income (Coad et al., 2010; Fa et al., 2002). Where meat poaching occurs, wire snaring is a popular method given that snares are inexpensive, effective, and easy to obtain, set and conceal (Noss, 1998). Due to their non-selective nature, however, snares can inflict significant by-catch mortality on a variety of species (Lindsey et al., 2011; Noss, 1998).

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The impacts of snaring on wildlife species have been quantified primarily for the target species utilized in the bushmeat trade; however, given the non-selective nature of snares, a number of non-target threatened species can incur considerable impacts from by-catch mortality. This can especially impact large herbivores and carnivores given that they are long-lived and wide-ranging, they occur at low-densities often further diminished by human influences, and have age-dependent rates of survival and reproduction (Creel and Creel, 2002; Eberhardt, 2002; Packer et al., 2005, 1998), yet the impact of by-catch mortality on these species is poorly understood.

The African elephant is listed as a vulnerable species by the International Union for Conservation of Nature (IUCN), and is threatened by firearm poaching for ivory and meat (Blanc, 2008). However the contribution of snaring to overall elephant mortality is poorly described. Elephants may be particularly susceptible to snaring in some systems as they are often attracted to agricultural areas within and around protected area communities where snaring is thought to be highest (Lewis and Phiri, 1998; Lindsey et al., 2011; Wato et al., 2006;). Injured animals such as elephants and buffalo can also present a serious danger to humans, potentially exacerbating human-wildlife conflict in these areas. Among large carnivores, lions are also IUCN vulnerable and have experienced declines continent-wide in the last few decades (Bauer et al., 2008). While lions are not currently a target species, their propensity to frequent areas with high prey density (van Orsdol et al., 1985), where snaring is likely to be more prevalent, and where snared carcasses can also be scavenged, makes them susceptible to poaching by-catch (Becker et al., in press). Wild dogs are IUCN endangered and one of the most imperiled carnivores on the continent, largely due to human impacts such as direct persecution and conflict, disease, and poaching (Creel and Creel, 1998; Woodroffe et al., 2004). Because of their wide-ranging behavior and propensity to frequent low lion density areas (Creel and Creel, 1996) outside protected areas, wild dogs can be heavily impacted by snaring, and some populations have been extirpated (Leigh, 2005; Pole, 1999). Large carnivores in particular may be strongly affected because both they and their prey are affected by snaring (Hofer et al., 1993; Ray et al., 2002). Evaluating the impacts of snaring on these species is therefore of critical significance in ecosystems where poaching is prevalent.

Zambia's Luangwa Valley (31.5E, 13.1S) is the country's most productive wildlife tourism area, with an economy depending heavily on revenue from photographic tourism and safari hunting centered in and around South Luangwa National Park (SLNP) and surrounding Game Management Areas (GMA; Fig. 1). Recent revenue estimates of $1 million USD from park fees and $488 800 USD from hunting revenue in the Lupande GMA (SLAMU, 2007, 2008) make it the country's premiere wildlife destination, and it contains Zambia's largest populations of elephants and lions, and the second-largest population of wild dogs (Simukonda, 2011; ZAWA, 2009, 2010). Collectively these species could be considered some of the most economically and ecologically important large mammal species. However, similar to many African protected areas (Wittemyer et al., 2008), the Luangwa's economic success from wildlife tourism has resulted in rapid human population growth. Consequently, encroachment and poaching represent a major concern for wildlife managers (ZAWA, 2010). Zambia has been a pioneer of community-based wildlife conservation initiatives (Lewis et al., 2011, 1990; Mwenya et al., 1988) and the extent of snaring activities can serve as effective metrics of community support for conservation (Lewis and Phiri, 1998). Commercial snaring in and

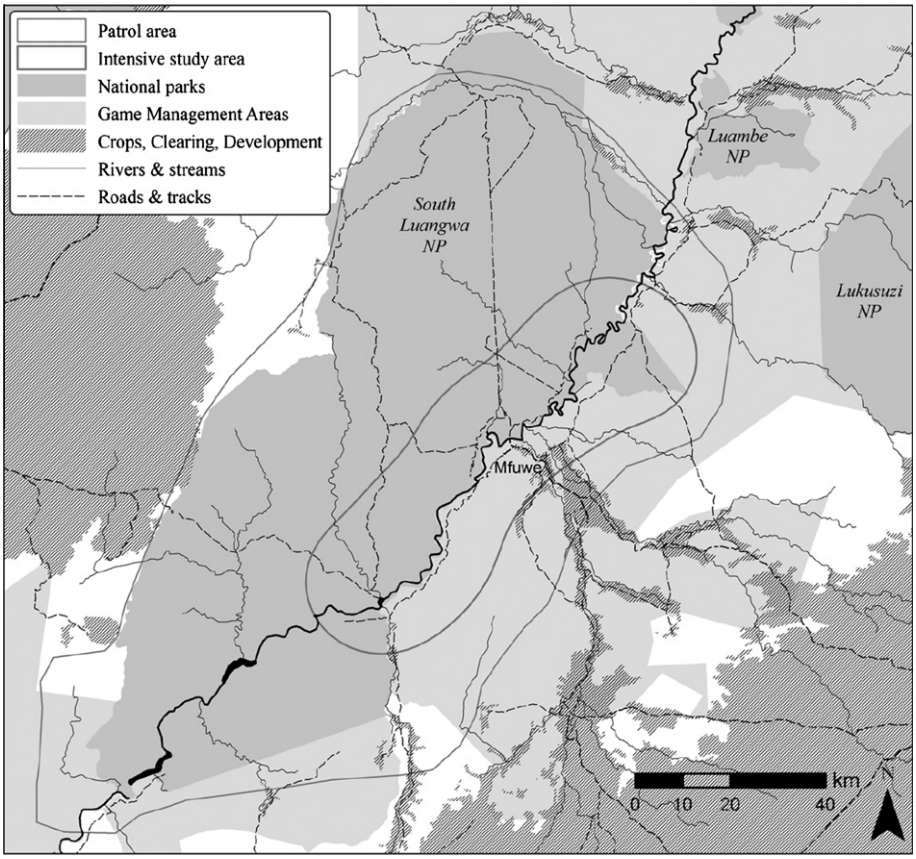

Fig. 1. The Luangwa Valley study area.