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Habitat use by honey badgers and the influence of predators in iSimangaliso Wetland Park, South Africa

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ABSTRACT

Land-use, the extent of cover, and intra-guild competition with larger predators all influence habitat use by mesocarnivores. Understanding this is especially important for little-known mesocarnivore species. We investigated the occurrence of the relatively understudied honey badger (*Mellivora capensis*) in iSimangaliso Wetland Park (St. Lucia, South Africa), a Protected Area that covers approximately 700 km^2 with forestry plantations (agroforestry) on its Western Shores and restored natural vegetation on its Eastern Shores and Western Shores. We used single-season camera-trap data from a grid of 118 trap stations surveying continuously for 24 days, and estimated the probability of occupancy and detection of honey badgers, and modelled the influence of surrounding land-use, habitat characteristics and presence of other predators on each estimate. Mean estimated probability of occupancy of honey badgers was 0.38 ± 0.08 and probability of detection was 0.12 ± 0.03, with a naïve occupancy estimate of 0.25. Distance to water and higher number of trees in adjacent plantations influenced honey badger occupancy positively. Presence of leopard (*Panthera pardus pardus*) had a negative effect on detection probability of honey badger while presence of spotted hyena (*Crocuta crocuta*) positively influenced honey badger detection, indicating that the presence of individual predator species influenced honey badger habitat use in varying ways. We found a higher occurrence of honey badgers in *Eucalyptus* plantations than in natural habitat types. This suggests that human-modified landscapes may not always be detrimental to adaptable, or more habitat-generalised species that are able to exploit new habitat opportunities.

Introduction

Globally, the effect of anthropogenic change of natural landscapes may be illustrated by continued habitat fragmentation, degradation and deforestation (Beasley et al., 2011; Lee and Carroll, 2014; Prange et al., 2004). Agriculture, urban development, and extraction of resources are all anthropogenic activities that contribute to the change in human-modified landscapes over time (Brown et al., 2013; Swihart and Moore, 2004). Land-use and land-cover changes can induce adverse effects on wildlife (Beasley et al., 2011; Turner et al., 1994), including displacement, habitat and resource loss, and various isolation effects on populations (Andren, 1994; Chapin et al., 2000). Differences in landscapes allow for habitat partitioning and variation in habitat use by carnivores (Lantschner et al., 2012), which are their responses to spatio-temporal change, individual movement, population dispersion, and altered habitat structure or resource availability, and also their adaptability or specialisation, including ability to exploit alternative prey types, and adapt to differing niches (Kalle et al., 2014; Milan et al., 2015; Sunarto et al., 2015). In particular, anthropogenic land-use change can further alter or affect spatio-temporal patterns of carnivores (Moreira-Arce et al., 2016; Wang et al., 2015).

Interspecies interactions between carnivores are influenced by species diversity and habitat (Ramesh et al., 2016, 2017). Apex predators, the largest carnivores within a particular ecosystem, exert pressures on mesocarnivores (small to medium-sized mammalian predators weighing 1–15 kg (Prugh et al., 2009)). Apex predators hunt smaller mammals, but are not limited to feeding on herbivores, sometimes preying on mesocarnivores. Some mammal species employ strategic avoidance and marked behavioural patterns in foraging and habitat use to reduce encounters with apex predators (Cove et al., 2012). Many mesocarnivores are difficult to study in the wild due to their elusive, cryptic and nocturnal habits (Ramesh and Downs, 2014a), including the use of subterranean

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dens. Kalle et al. (2014) noted that some of the monitoring techniques used in the past, such as opportunistic sightings, random or structured interviewing of local communities, track and sign surveys and rapid surveys, are not systematic and often unsuited for studying mesocarnivores. These methods are affected by spatial and seasonal constraints, but may still fail to account for variation in occupancy and detection probability (Gupta et al., 2012; Kalle et al., 2014; Ramesh and Downs, 2014b; Ramesh et al., 2016, 2017). As mesocarnivore presence is affected by large predator presence (Schuette et al., 2013), camera-trap surveys have been used in recent years to determine population estimates and habitat use of various species (Anile and Devillard, 2015; Gupta et al., 2012; Kalle et al., 2014). The effects of anthropogenic land-use change on many elusive mesocarnivores are poorly known; however, some species are known to persist and thrive in human-altered ecosystems (Bateman and Fleming, 2012; Widdows and Downs, 2016).

The honey badger (or ratel, *Mellivora capensis*; Skinner and Chimimba, 2005), is a widely distributed mesocarnivore found on different continents: across Africa, in western Asia, the Arabian Peninsula and the Indian Peninsula (Gubbi et al., 2014; Gupta et al., 2012; Skinner and Chimimba, 2005). Nevertheless, information on its ecology and distribution is scant. Female honey badgers weigh 5–10 kg, and males up to 16 kg (Begg et al., 2005). Females have up to two kits at a time and provide parental care for up to 2 years

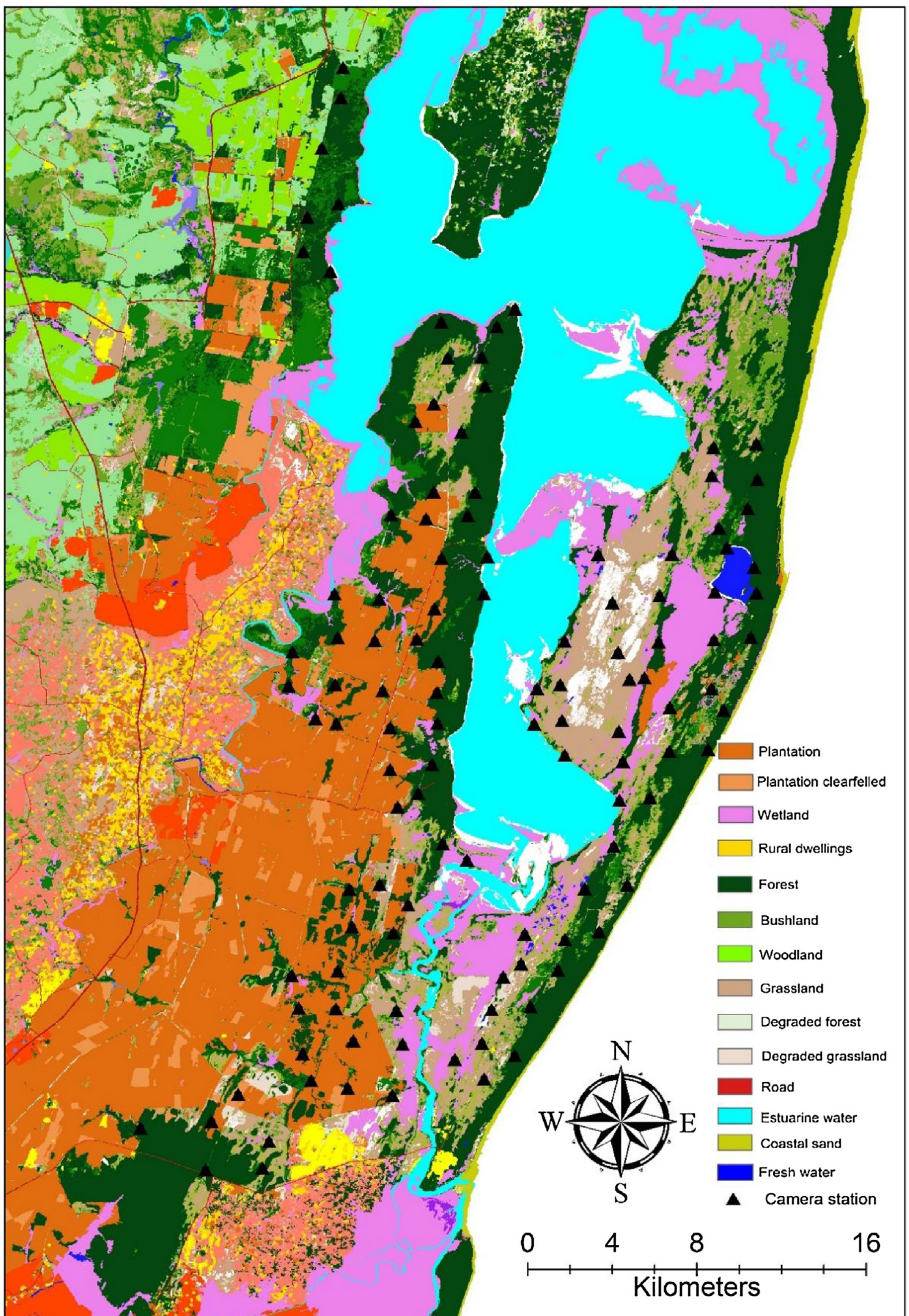

Fig. 1. Map of 118 survey sites with camera trap stations in the iSimangaliso Wetland Park, South Africa (Ramesh et al., 2016).