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Original Investigation

Free-ranging domestic cats reduce the effective protected area of a Polish national park

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ABSTRACT

Poland's Animal Protection Act, as of 2002, made it legal to shoot free-ranging cats and dogs. The act triggered substantial social debate with opponents arguing that this legislation was weakly supported by scientific evidence of the ecological impacts of free-ranging pets. Our main research goal was to examine the activity of free-ranging domestic cats within a Polish protected area by applying radio-telemetry methods to determine space use and degree of encroachment into the national park. We trapped and radio-tracked 19 animals from three sites (focal households) located in Ojcow National Park (ONP) in southern Poland from June 2003 to March 2006. Annual 100% MCP home range size varied from 0.02 km^2 to 1.46 km^2, and was significantly larger for males (mean ± SE = 0.79 ± 0.34 km^2; median = 0.53 km^2) than for females (mean ± SE = 0.13 ± 0.05 km^2; median = 0.13 km^2). The distance travelled by individual cats from focal sites did not significantly differ between males (mean ± SE = 232.00 ± 21.05 m; median = 191 m) and females (mean ± SE = 232.50 ± 12.47 m; median = 228 m), with maximum distances of 1.5 km for males and 1.1 km for females. All monitored cats were in close proximity to nature reserves and ranged into protected areas without any human control. Cats living in the households in the park and its surrounding buffer zone, roaming at 200 m and 1000 m radius distances from their households, occupied from 6% to 100% of the park area, respectively. Our results reveal that free-ranging domestic cats roam through and potentially impact the entire national park, thus reducing its effective protected area.

Introduction

The domestic cat (*Felis silvestris catus*), together with the domestic dog (*Canis lupus familiaris*), is one of the most popular companion animals. Even though humans and cats have long coexisted, these animals maintain the ability to live in both residential neighbourhoods and in the wild and are capable of subsisting without help from their owners (Fitzgerald and Turner, 2000). Although some owners believe that the additional feeding of cats may decrease their willingness to hunt and that only hungry animals will more effectively eradicate pests such as rodents (Fitzgerald and Turner, 2000), even fed cats actively hunt (Liberg, 1984; Churcher and Lawton, 1987; Crooks and Soulé, 1999; Fitzgerald and Turner, 2000; Lepczyk et al., 2003; Woods et al., 2003; Kays and DeWan 2004; Baker et al., 2010; van Heezik et al., 2010). Moreover, although feeding cats may reduce their motivation to hunt and thus decrease their per capita impacts on wildlife (Kays and DeWan, 2004; Silva-Rodríguez and Sieving, 2011), such human subsidies also allow cat populations to reach inflated densities that may result in high cumulative impacts on prey populations (Schmidt et al., 2007; Tennent and Downs, 2008).

Cats are extremely abundant in the majority of the world's countries. As of 1996, there were 5 million cats in Poland and 33 million in Central Europe (Turner and Bateson, 2000). Other authors estimate, based primarily on survey research, that there are about 9 million cats in Britain (Woods et al., 2003) and more than 100 million in the USA (Levy and Crawford, 2004; Robertson, 2008). The density of cats varies considerably, from less than 3 to more than 20 individuals per ha, depending mainly on food availability (Baker et al., 2010). Likewise, home range size varies between 0.002 km^2 to 0.07 km^2 for females and 0.008 km^2 to 0.08 km^2 for males in urban areas (Say and Pontier, 2004; Tennent and Downs, 2008), between 0.002 km^2 to 0.01 km^2 for females and 0.008 km^2 to 0.11 km^2 for males in suburban areas (Kays and DeWan, 2004; Schmidt et al., 2007; Morgan et al., 2009), and between 0.03 km^2 to 0.87 km^2 for females and 0.04 km^2 to 4.30 km^2 for males in natural woodlands and agroforestry areas (Meek, 2003; Ferreira et al., 2011). The home range of female cats is determined by abundance, availability and distribution of food and shelter, as these factors affect female reproductive success; that of males primarily depends on density of

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females, the degree of synchrony of female receptivity to mating and the size and stability of female groups (Sandell, 1989; Liberg et al., 2000; Say and Pontier, 2004).

The ecological impact of free-ranging domestic cats depends on a variety of conditions, including prey distribution and abundance, level of human reliance, individual differences and the presence of other carnivores (Churcher and Lawton, 1987; May and Norton, 1996; Barratt, 1998; Fitzgerald and Turner, 2000; Lepczyk et al., 2003). In places where nature conservation is a priority, such as protected areas and national parks, predation by domestic animals, including both cats and dogs, may pose distinct threats. Risks include predation on prey species (Harper, 2007; Medina and Nogales, 2009; Dickman, 2009; Vanak and Gompper, 2010; Young et al., 2011), competition with native animals (Phillips et al., 2007; Watanabe et al., 2003; Glen and Dickman, 2005; Vanak and Gompper, 2010), transmission of infectious agents to wildlife (Butler et al., 2004; Suzán and Ceballos, 2005; Mendes-de-Almeida et al., 2007; Robertson, 2008) and hybridization with native carnivores, including domestic cats with European wildcats (Germain et al., 2008; Oliveira et al., 2008; Hertwig et al., 2009) and domestic dogs with gray wolves and dingoes (Savolainen et al., 2004; Elledge et al., 2008; Randi, 2008). A solution to this problem is therefore essential for effective conservation of wildlife (Calver et al. 2011; Silva-Rodríguez and Sieving, 2011).

In an effort to mitigate ecological impacts of outdoor cats by reducing the extent to which the roam away from households, Poland's Animal Protection Act of 2002 legalized lethal control of free-ranging cats, particularly those that might potentially threaten wildlife. Specifically, according to the regulation, "*. . .it is legal to shoot free-ranging cats and dogs found at least 200 metres from the nearest household. . .*" and "*. . .the animal must look as abandoned (feral), malnourished and should pose a threat to wildlife. . .*". The Act, however, is somewhat ambiguous and can be misused as it does not define "free-ranging" or "feral" animals. Moreover, the regulations were based on weak and dated evidence of the ranging behaviour and potential impacts of cats (Ryszkowski et al. 1973; Pielowski 1976; Romanowski 1988) and dogs (Okarma et al. 1995) on local wildlife, primarily through anecdotal reports from foresters and game managers not supported by scientific research conducted in Poland. The growing number of cats and dogs in Poland is an increasing problem and has raised a series of prolonged public disputes.

To date, no reliable information exists on the ranging behaviour and thus possible impacts of domestic cats on wildlife and on protected ecosystems in Poland. In addition, in Poland specifically, no prior studies have evaluated activity and space use of domestic cats with radio-tracking techniques. Thus, our main research goal was to assess the space use of male and female free-ranging domestic cats within Ojcow National Park (ONP) in southern Poland. Consistent with prior studies (Yamane et al., 1994; Say and Pontier, 2004; Guttilla and Stapp, 2010), we expected that home ranges would vary with gender. We also examined the extent of movement of cats from household feeding stations, and estimated how this might reduce the effective protected area of the national park. If the legislation restricting free-ranging cats effectively reduced ranging behaviour and potential ecological impacts of outdoor cats, then we would expect cats in the national park would be largely restricted to households, particularly within the designated 200 m limit.

Methods

Study area

We conducted our study in Ojcow National Park (ONP), situated in the southern part of Krakowsko – Czestochowska Upland, Poland

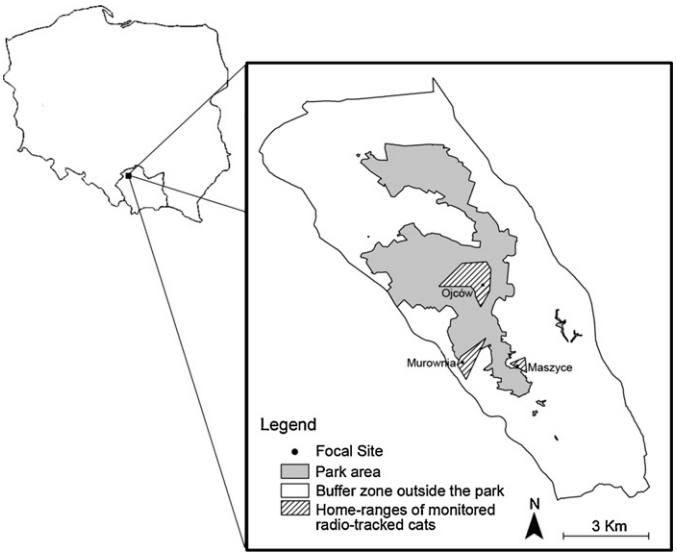

Fig. 1. The study area, Ojcow National Park (ONP), located in Malopolska district in southern Poland. Ojcow, Maszyce and Murownia are villages and focal sites for the radio-tracked cats. The 100% MCP home range for the population of monitored cats at each focal site is presented (GIS map courtesy of ONP Directorate).

(50°12′N, 19°46′E). With 22 km^2 of total core area and 2.5 km^2 under strict reserve protection, it is the smallest national park in Poland. The core area is surrounded by a designated 68 km^2 buffer zone, which is predominantly covered by fields, pastures and farm houses. Dominant habitats of the park consist of deciduous and mixed forests covering about 15 km^2 of the study area.

A small village, Ojcow (234 permanent residents), is centred in the park core area. Two other villages, Maszyce (360 residents) and Murownia (100 residents), are located in the southern edge of the park (Partyka, 1992) (Fig. 1). Due to its close proximity to large industrial and urban metropolises such as Krakow and Katowice, as well as its numerous attractions, ONP is visited by approximately 400,000 tourists each year, most often between May and October. During tourist season, local residents within the park operate businesses such as restaurants and lodging (Partyka, 2002). Most residents within the core area do not have farms, whereas the majority of residents of the buffer zone are farmers.

ONP is comprised of the valleys of two creeks and has mountain climate characteristics. ONP supports approximately 11,000 animal species (with ca. 5000 insects), including many rare species of flora and fauna (Partyka and Klasa, 2008). Bats (*Chiroptera*) are common, and include 17 out of 25 species recorded in Poland. Among larger mammals, roe deer (*Capreolus capreolus*), wild boar (*Sus scrofa*), European brown hare (*Lepus earopaeus*) and European beaver (*Castor fiber*) are frequent. Wild carnivores include red fox (*Vulpes vulpes*), pine and stone martens (*Martes martes, M. foina*), weasel (*Mustela nivalis*), stoat (*Mustela erminea*), Eurasian badger (*Meles meles*), polecat (*Mustela putorius*), otter (*Lutra lutra*) and raccoon dog (*Nyctereutes procyonoides*) (Wierzbowska et al., 2008). 19 small mammal species have been recorded in ONP, as well as 120 bird species, 94 of which are breeding in the park. 218 of the animal species living in ONP are protected by law (Wierzbowska et al., 2008; Tomek, 2008).

Radio-telemetry

We used radio-telemetry to determine space use and home range sizes of free-ranging cats. We collared cats from three villages located in the ONP: Ojcow, Maszyce and Murownia (Fig. 1). As of the start of the study in 2003, Poland's Animal Protection Act