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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 Ojców National Park (ONP) in southern Poland from June 2003 to March 2006. Annual 100% MCP home range size varied from 0.02 km² to 1.46 km², and was significantly larger for males (mean \pm SE = 0.79 \pm 0.34 km²; median = 0.53 km²) than for females (mean \pm SE = 0.13 \pm 0.05 km²; median = 0.13 km²). The distance travelled by individual cats from focal sites did not significantly differ between males (mean \pm SE = 232.00 \pm 21.05 m; median = 191 m) and females (mean \pm SE = 232.50 \pm 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.

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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 km² to 0.07 km² for females and 0.008 km² to 0.08 km² for males in urban areas (Say and Pontier, 2004; Tennent and Downs, 2008), between 0.002 km² to 0.01 km² for females and 0.008 km² to 0.11 km² for males in suburban areas (Kays and DeWan, 2004; Schmidt et al., 2007; Morgan et al., 2009), and between 0.03 km² to 0.87 km² for females and 0.04 km² to 4.30 km² 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 Ojców 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 Ojców National Park (ONP), situated in the southern part of Krakowsko – Czestochowska Upland, Poland

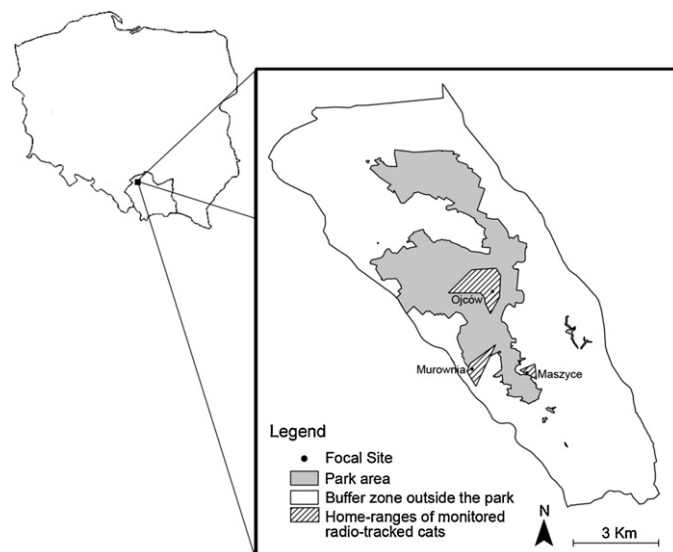


Fig. 1. The study area, Ojców National Park (ONP), located in Malopolska district in southern Poland. Ojcow, Maszyce and Murowna are villages and focal sites for the radio-tracked cats. The 100% MCP home range for the population of monitored cats at each focal site is presented (GIS map courtesy of ONP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

(50°12'N, 19°46'E). With 22 km² of total core area and 2.5 km² under strict reserve protection, it is the smallest national park in Poland. The core area is surrounded by a designated 68 km² 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 km² 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 Murowna (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 Murowna (Fig. 1). As of the start of the study in 2003, Poland's Animal Protection Act

did not permit research on feral cats or dogs. Therefore, we located the owners of outdoor, free-ranging cats within the study area who would give us permission to monitor their cats. Based on the definitions provided by Bradshaw et al. (1999), the monitored cats in this study would be classified as semi-feral: outdoor animals, irregularly subsidized with human-provided food, and showing friendly behaviour towards people. We defined the focal site within each village as the household where monitored animals returned for provided food or shelter. There was only one feeding station within each focal site. Subsidized food at feeding stations, provided about once every week or two weeks, consisted of discarded human food (i.e., leftovers) in Ojcow and Maszyce villages, and commercial cat food in Murownia.

We performed our investigation according to procedures indicated and approved by Local Bioethical Commission in Krakow (52/OP/2002). The animals were physically caught and handled with the help of the owners. The cats were weighed and sexed, and were aged with knowledge of the owners; mature (at least two-year old) cats were fitted with radio-collars (L-1/ER 1028 [I,N] 36 g, Andreas Wagener Telemetrienanlagen) with batteries lasting for 2 years. After completing the research, we removed the collars from the animals.

From June 2003 to March 2006, the cats were monitored using a portable receiver (YAESU VR 500, Andreas Wagener Telemetrienanlagen, Koeln, Germany) with Yagi type antenna (Andreas Wagener Telemetrienanlagen, Koeln, Germany). Individual cats were monitored once a week, during approximately 4 h periods throughout day and night hours, classified with reference to sunrise and sunset times; monitoring days and hour periods were randomly chosen. Time intervals between consecutive locations for each individual were no less than 30 min. We located cats by homing their position on foot. The observers were able to approach closely without disturbing the animal to improve the accuracy of established locations of the focal animals. The locations were recorded as Universal Transverse Mercator (UTM-WGS 84) coordinates and stored within a Geographic Positioning System receiver ProXRS (Trimble).

Home ranges

We calculated the home range of each individual as a 100% minimum convex polygon (White and Garrott, 1990; Weber and Dailly, 1998; Biró et al., 2004) using RANGES 7 (Anatrack, Oxford, England). Although this home range estimator has limitations, especially the potential inclusion of areas not utilised by the animal (Macdonald et al., 1987), we decided to choose this method for consistency with prior studies on cats (Jones and Coman, 1982; Liberg, 1984; Macdonald et al., 1987; Weber and Dailly, 1998; Hall et al., 2000).

We compared sizes of home ranges between gender with Mann–Whitney *U* test. We excluded from the analysis home ranges that were based on less than 20 fixes (Fitzgerald and Karl, 1986; Goltz et al., 2008). Due to owners prematurely removing their cats from the study in Murownia and Maszyce (see Results), statistical analyses of home ranges were conducted only for cats from Ojcow.

Movements

We recorded movements of radio-collared cats from their focal households within Ojcow village and calculated mean, median and maximum straight-line distances of each radio-tracked cat from the focal site. We used Mann–Whitney *U* test to evaluate differences between median distance travelled by the cats with respect to gender.

Effective protected area

To model the extent to which free-ranging cats encroached into the park and reduced its effective protected area (i.e., area in which native biota are effectively protected), we first estimated the numbers of the cats living within and directly adjacent to ONP. To do so, we interviewed the local citizens in the ONP core area and buffer zone, and concurrently confirmed the records of households with free-ranging cats with the service officers of the park. We then displayed the locations of known households with cats, and generated two different distance maps assuming free-ranging cats moved up to 200 m and 1000 m from houses. Those two values corresponded to the 200 m distance from households within which feral cats and dogs can be shot as stated in Poland's Animal Protection Act of 2002, and the approximate 1 km maximum distance travelled by radio-tracked cats in this study. Finally, using these two distance maps, we determined the size of the ONP core area potentially affected by free-ranging cats.

Results

Home ranges

We captured and fitted 19 cats with radio-collars, including four (two males, two females) in Maszyce, five (three males, two females) in Murownia and 10 (four males, six females) in Ojcow (Table 1). The cats were not neutered or spayed. The duration of radio-tracking of each individual varied from 2 to 20 months. The number of fixes per individual ranged from 3 to 72 (mean \pm SE = 23 ± 5 annually; Table 1).

In Ojcow, where we collected the most reliable data, the annual 100% MCP home range size varied from 0.02 km² to 1.46 km² (Table 1). Annual home ranges were significantly larger ($U = 0.00$, $P = 0.037$) for males (mean \pm SE = 0.79 ± 0.34 km²; median = 0.53 km²) than for females (mean \pm SE = 0.13 ± 0.05 km²; median = 0.13 km²).

In Maszyce, there were four cats that occupied the same area around the farms where they were fed. The fixes overlapped and the cats utilised similar home ranges, moving within a small area located between a few houses and farmlands. After two months of radio-tracking, the owners decided to remove the collars from their animals (Fig. 1, Table 1).

Similar to Maszyce, in Murownia, the fixes overlapped for four of the five tracked animals. Within several months, the owners removed radio-collars on males M11, M12 and M13, and the remaining two females (F14 and F15) were road-killed (Fig. 1, Table 1).

Movements

Cats varied in the degree to which they roamed from their focal households. The proportion of monitored time spent by cats within 200 m from focal sites was 61%, 73% and 40% for Ojcow, Murownia and Maszyce, respectively. The distance travelled by individual cats from focal sites did not significantly differ ($U = 7.00$; $P = 1.000$) between males (mean \pm SE = 232.00 ± 21.05 m; median = 191 m) and females (mean \pm SE = 232.50 ± 12.47 m; median = 228 m). The maximum distance travelled from focal sites was 1494 m (male M2) and 1090 m (female F6).

Effective protected area

Based on interviews with residents and ONP rangers, we estimated that the national park, including the surrounding buffer zone, was inhabited by approximately 182 cats, of which 54 animals

Table 1

Radio-tracking details of domestic cats monitored in Ojcow National Park between June 2003 and March 2006. n/a – not applicable (<20 fixes).

Focal site	Individual	Duration of radio-tracking [months]	Individual's age [years]	100% MCP annual home range size [km ²]/number of fixes
Ojcow	Male 1	20	9	0.529/72
	Male 2	12	2	1.457/22
	Male 3	7	3	n/a
	Male 4	20	2	0.348/63
	Female 5	14	2	0.148/38
	Female 6	19	5	0.298/71
	Female 7	13	9	0.131/51
	Female 8	1	2	n/a
	Female 9	9	2	0.072/20
	Female 10	9	2	0.020/21
Murownia	Male 11	2	2	n/a
	Male 12	2	2	n/a
	Male 13	2	3	n/a
	Female 14	2	4	n/a
	Female 15	2	5	n/a
Maszyce	Male 16	2	3	n/a
	Male 17	2	2	n/a
	Female 18	2	10	n/a
	Female 19	2	2	n/a

lived in Ojcow village, within the core area of ONP. We identified three relatively large groups of cats, including 2 groups of 10 and 8 individuals in Ojcow (including 8 and 2 cats used for radio-tracking), and 1 group of 20 individuals in Murownia (including 5 used for radio-tracking). In Maszyce, cats were associated with three households and we radio-tracked 5 individuals out of 10 in one part of the village. The remaining cats ($n = 128$) lived individually in households located throughout the buffer zone of the park.

For the cats living within the park, the total ONP core area potentially used by cats was 6.5 km² and 21.5 km² for 200 m and 1000 m radius distances around park households, representing 30% and 100% of the park area (Fig. 2a). Cats living in the buffer zone outside the park potentially affected 6% of the park core area when moving up to 200 m from households, and 90% of the park core area if moving up to 1000 m from households (Fig. 2b).

Discussion

Our results provide the first description of the space use of free-ranging domestic cats in Poland, and an unusual example of cat activity and encroachment in a national park. Home ranges of domestic cats occupying rural farmlands or forests tend to be considerably larger than those living in urban and suburban areas (Barrat 1997; Kays and DeWan, 2004; van Heezik et al., 2010; Tschanz et al., 2011). The average annual home range sizes of monitored cats in forests of the ONP (males: 0.79 km², females: 0.13 km²) are similar to home range sizes for rural domestic cats elsewhere, including in California (males and females: 0.32 km²; Hall et al., 2000), Switzerland (males: 0.72 km², females: 0.60 km²; Turner and Mertens, 1986), France (males: 0.70 km², females: 0.21 km²; Germain et al., 2008), and on the South Island in New Zealand (males: 0.72 km², females: 0.36 km²; Metsers et al., 2010).

Territory size occupied by cats depends on individual characteristics (Weber and Dailly, 1998), and although some cats spent much of their time close (within 200 m) of the feeding stations, home range sizes and distances travelled in our study varied among individual cats. Some had relatively small ranges (e.g., 0.07 km² and 0.02 km² for females F9 and F10), whereas other cats roamed considerably (e.g., 1.46 km² for male M2). The majority of the monitored cats with the largest home ranges were very active, which was evident by the large distance traversed from the focal sites and amount of time spent outside of them. For example, one male (M2) was recorded at a maximum distance of 1494 m away from the focal site and maintained a home range of 1.46 km². A female (F6) travelled up to 1090 m away from the household and maintained

a home range of 0.30 km². Previous studies confirm that although free-ranging cats typically do not roam far from their homes, some individuals can move much longer distances (Meek 2003; Brickner-Braun et al., 2007; Ferreira et al., 2011).

We predicted that gender might be an important factor determining home range size. Accordingly, home ranges occupied by males were larger than those used by females, consistent with prior studies (e.g., Warner, 1985; Yamane et al., 1994; Say and Pontier, 2004; Guttilla and Stapp, 2010, but see Hall et al., 2000; Morgan et al., 2009; Metsers et al., 2010). Although documenting sociality was not a primary objective of this study, it was evident that home ranges of individuals monitored in our study overlapped extensively. Overlapping home ranges, particularly in Ojcow and Murownia villages, suggest that cats might be living in colonies, perhaps consisting of related individuals. The most detailed data we collected were for cats monitored in Ojcow. The owner of these cats indicated that four females (F5, F6, F8, F9) were daughters of female 7, and only one female (F10) was unrelated. This unrelated female was living nearby, although it was using different shelters. Kerby and Macdonald (1994) observed that cat groups are defined by females through matrilineal lines and are maintained by recruiting female kittens and excluding non-related females. The colonies in our study could be created as a consequence of the cats being fed directly by people or scavenging from restaurants and guest room waste disposal sites. Additionally, Ojcow village is surrounded by forests and meadows, creating a hunting area with an easy prey access. Liberg and Sandell (1994), reviewing results of studies on feral cats throughout the world, concluded that group-living cats occurred where food supplies are rich and clumped.

Our results suggest that the population of free-ranging cats in ONP potentially use the entire park. Our interviews of residents and park staff revealed that ONP is inhabited by a minimum of 182 cats, and of those, 54 lived in the park core area. With the simulation maps, we calculated that cats roaming at a maximum distance of 200 m from their households encroached into 6–30% of the park core area. With a maximum roaming distance of 1000 m from households, which was recorded for some individuals, even the cats living in buffer zone could occupy the entire ONP core area (Fig. 2).

If the population of free-ranging cats indeed have access to the entire ONP, then they have the potential to predate on native fauna throughout the park, thus reducing the ability of this protected area to function effectively. Cats in ONP were active both day and night, suggesting that their predation could impact both diurnal and nocturnal prey species. We periodically found prey items returned to

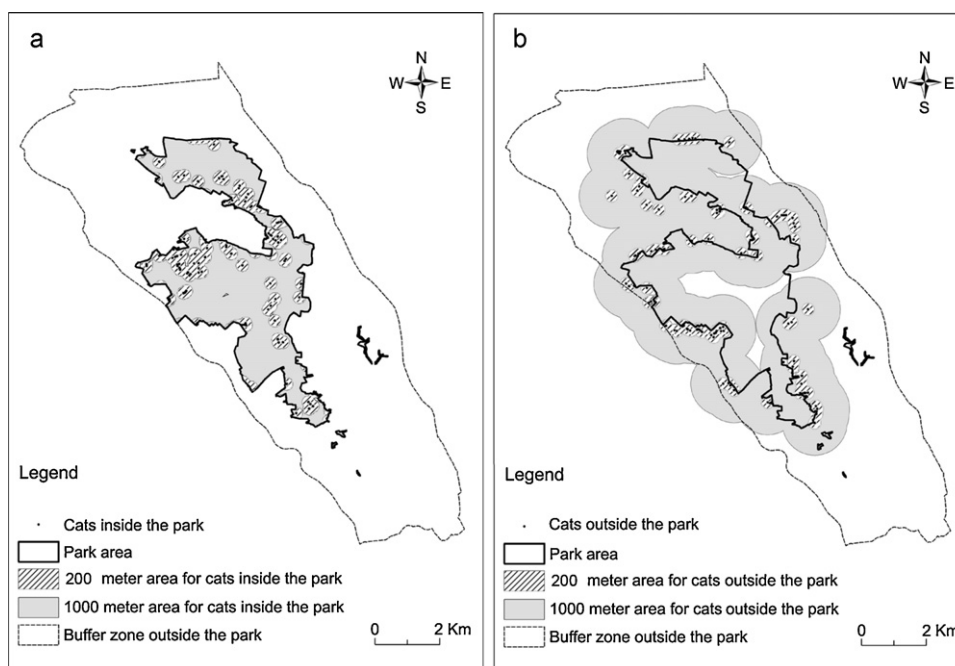


Fig. 2. Estimated size of Ojcow National Park core area (excluding buffer zone) affected by roaming domestic cats living: (a) inside the park ($n = 54$): 6.5 km² (30% of park area) occupied by cats at a distance of 200 m radius from a household; 21.5 km² (100% of park area) occupied by cats at a distance of 1000 m radius from a household; (b) living in buffer zone surrounding the park ($n = 128$): 1.32 km² (6% of park area) occupied by cats at a distance of 200 m radius from a household; 19.8 km² (90% of park area) occupied by cats at a distance of 1000 m radius from a household.

feeding stations, including shrews (*Sorex* spp.), edible dormouse (*Glis glis*) and weasel, species strictly protected in Poland. In pilot research on cat diets in ONP, the most common remains in scats were small mammals, including common vole (*Microtus arvalis*), field vole (*Microtus agrestis*) and wood mouse (*Apodemus flavicolis*) (Wierzbowska et al., 2008). Other native predators, including red foxes and pine martens, utilised similar prey (Wierzbowska et al., 2005), suggesting the potential for interspecific competition of such predators with domestic cats.

The ecological impacts of free-ranging cats that roam into adjacent natural areas vary, with some studies suggesting strong impacts (e.g., Crooks and Soulé, 1999; Meek, 2003; Morgan et al., 2009; van Heezik et al., 2010) and others suggesting weaker effects on prey populations (e.g., Kays and DeWan, 2004). Population-level impacts of domestic cats on native populations of predator and prey in ONP are unknown and require further study. However, despite this uncertainty, application of the precautionary principle would advocate action to protect native fauna from cat predation within the park given that there is a scientifically plausible risk (Calver et al., 2011).

Conclusions

Many studies have suggested the need to diminish detrimental effects of housecats on natural ecosystems, with special emphasis on protected areas that house diverse assemblages of native prey species (Dickman, 2009; Morgan et al., 2009; Tennent et al., 2009; Dauphiné and Cooper, 2011). According to Poland's Animal Protection Act of 2002, at least some of the cats in our study could be shot, particularly if they appear feral and pose a threat to wildlife, as the mean distance they roamed from the focal sites exceeded 200 m. Eradication of cats by shooting, however, is controversial and increases public concern and conflict (Ash and Adams, 2003; Robertson, 2008; Oppel et al., 2010). Moreover, as of 1st January 2012, Poland's Animal Protection Act has been changed, with the paragraph about shooting free-ranging cats and dogs removed and

the problem of stray cats completely disregarded. Instead of lethal control, sterilisation might be attempted, although relatively high sterilization rates are necessary to reduce population sizes (Jones and Downs, 2011), and recent studies have demonstrated that both home ranges size and long distance movements of sterilized and reproductively intact cats did not differ (Levy and Crawford, 2004; Guttilla and Stapp, 2010). Another proposed solution is collars with attached bells or electronic sonic devices, which can reduce cat predation (Nelson et al., 2005; Calver et al., 2007; Gordon et al., 2010) but are not always effective (Paton, 1991; Barratt, 1998; Ruxton et al., 2002; Woods et al., 2003). Similarly, restricting cats indoors during night, although certainly reducing hunting opportunities, does not fully eliminate predation impacts (Barratt, 1997; Woods et al., 2003; Morgan et al., 2009).

Therefore, we suggest that the most effective measure to mitigate cat impacts would be to implement cat-exclusion zones in protected areas such as national parks (Metsers et al., 2010; Calver et al., 2011), including ONP. Exclusion zones would require feral cats being trapped within parks, and lethally controlled or potentially delivered to animal shelters for adoption. In addition, pets belonging to households located within national parks and their buffer zones should be registered, sterilized, and restricted indoors both day and night (Clarke and Pacin, 2002; Guttilla and Stapp, 2010; Metsers et al., 2010).

Total confinement of cats, however, typically is not popular among cat owners (Lilith et al., 2006). Moreover, unlike in many Western countries, such as Great Britain, Italy, the USA or Australia, neutering domestic pets in Poland is still not popular, in part due to relatively high costs (I. Wierzbowska, pers. obs.). There is neither legislation nor social pressure for it. Cat owners, especially from households in the countryside, intentionally let the animals roam freely and simultaneously feed them. Indeed, some of the free-ranging cats monitored within the national park in this study were owned and fed by park personnel. Thus, for cat-exclusion zones to be a viable conservation strategy, it is of primary importance to incorporate new legislation within Poland regarding management

and control of domestic cats and dogs, in particular in rural and protected areas. Stronger and more focused legislation would provide a legal basis for more effective management of free-ranging cats. In addition, development of effective education programs targeting cat owners will be necessary to implement cat-exclusion zones in ONP. In general, this issue is discussed only by specialists, like environmentalists, park rangers, hunters and foresters, but not by the general public. There is a need to publicise the problem of cats as a possible threat to wildlife and to provide community education on a larger scale and to encourage responsible ownership.

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