



Nuisances and welfare of free-roaming cats in urban settings and their association with cat reproduction



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ABSTRACT

Free roaming cats (FRC) are highly abundant in cities around the world. Increasing populations of these cats might result in impairment of cat welfare and cause nuisances and public health risks. In order to study the seasonal dynamics of FRC populations and its association with events of cat welfare impairment and nuisances, we analyzed a database of FRC-associated citizens' telephone complaint events, which were registered in five cities in Israel (total human population of 1.42 million residents) during the years 2007–2011. These complaint events were classified to the following six categories: cat's carcasses, kittens, parturition, aggressive behavior toward people, invasion to human facilities, and cat injuries and distress. Overall, 87,764 complaint events associated with these categories were registered in the five cities during the study period (123.2 complaint events per 10,000 citizens per year). Length of daylight was moderately correlated with the rate of complaints on kittens in the same month ($r=0.64$) and parturition in the previous month ($r=0.54$) ($P<0.001$). Both kitten and parturition-related complaints showed a prominent seasonal pattern, peaking in April and May, respectively, and declining gradually until November. 'Kittens' or 'parturition' were explicitly mentioned in 38%, 39% and 19%, respectively, of the complaints regarding cat aggressiveness toward people, cat invasion to human facilities and cat injuries and distress. In most of the cities the rate of citizen complaints regarding carcasses, aggression, invasion and injuries were still significantly correlated with rate of complaints regarding kittens after omission of these joint complaints and remained significant after controlling for seasonality. These findings imply an association of cat welfare impairment and nuisances with FRC reproduction intensity. The current study revealed the high rate of nuisances and potential public health hazards related to FRC, as well as the impairment of cat welfare, which might be merely 'the tip of the iceberg' of the real welfare situation of these cats. Further studies should examine the effectiveness of FRC population control strategies for the reduction of the rate of nuisances and public health risks related to FRC, as well as for improving their welfare.

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1. Introduction

Free-roaming cats (FRC) are defined as non-confined domestic cats living in a public area (Slater, 2001). Living in high densities in the urban environment, where vital resources are abundant, populations of FRC can reach

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Table 1

Data on human population and jurisdiction area (2008 Population Census, Central Bureau of Statistics, Israel), and the amount of trap-neuter-return (TNR) of free-roaming cats (FRC) carried out between 2007 and 2011, in five cities in Israel.

City name	Beer-Sheva	Jerusalem	Holon	Rishon-Lezion	Ra'anana	Total
Total human Population	193,400	759,700	176,300	226,800	68,300	1,424,500
Jurisdiction Area [km ²]	117.5	125.2	18.9	58.7	14.9	335.2
TNR of FRC (per 10,000 citizens/5 years)	235.2 (2008 ^a)	88.9 (2006 ^a)	279.5 (2006 ^a)	272.1 (2009 ^a)	935.7 (2006 ^a)	

^a The year in brackets is the year municipal TNR campaigns begun.

numbers as high as 2300–3100 per Km² (Natoli, 1985; Izawa et al., 1991; Mirmovitch, 1995). Their presence might impose a public health risk and cause nuisances. While their potential to transmit several zoonotic diseases is well described in the literature (Comer et al., 2001; Singla and Juyal, 2005; Dabritz and Conrad, 2010; Gerhold and Jessup, 2013), there are little data to demonstrate the extent of public nuisances resulting from FRC. Only two studies examined this issue. Both were based on questionnaires: one study investigated the opinion of employees at the Texas A&M University, revealing general indifference to the issue; 46% of the respondents agreed to the non-specific statements that cats cause sanitation problems, 35% claimed that they cause odor problems, 12% responded that they pose physical threat to humans and 33% complained that they scatter garbage (Ash and Adams, 2003). The second study surveyed 397 households in Teramo province, Italy; 61% of the interviewees in this study agreed with the non-specific statement that free-roaming dogs and cats pose personal safety problem and 23% agreed these animals also pose environmental sanitation problem (Slater et al., 2008).

Public concern regarding FRC welfare has been raised in the last few decades. It was previously suggested that FRC welfare may be associated with the amount of care provided by cat feeders (Slater, 2007). Thus, in highly dense populations, where the care provided to FRC is limited, cats and especially kittens might suffer high rates of morbidity and mortality (Natoli, 1994; Gunther and Terkel, 2002). It was previously reported that 75% to 90% of kittens die before six months of age in high density FRC populations (Izawa and Ono, 1986; Mirmovitch, 1995; Nutter et al., 2004; Gunther et al., 2011). Data regarding infectious diseases affecting these populations are well established (Slater, 2007) and a recent study that used individual cameras on suburban outdoor pet cats, also found a high frequency of other life threatening hazards to these cats, such as crossing roads, encountering other cats, eating and drinking substances away from home, exploring storm drain systems and entering crawlspaces of houses (Loyd et al., 2013). In the last few decades, public concern regarding FRC welfare raised awareness for the use of non-kill methods to control of FRC population, mainly the trap-neuter-return (TNR) method (Slater et al., 2008; Gunther et al., 2011). However, established data regarding FRC nuisances and welfare impairment are essential for the design of cost effectiveness analyses of such plans towards controlling FRC populations.

The objectives of this study were therefore (i) to determine the temporal distribution of complaint calls regarding nuisances and welfare issues associated with FRC, and (ii) to examine their association with FRC population dynamics. In order to accomplish these objectives we analyzed a large municipal database, which includes over 90,000 citizen's registered complaint events regarding free-roaming cats. These data were collected over five years from five cities accommodating more than 1.4 million citizens.

2. Material and methods

2.1. Collection of data regarding public complaints

The five cities under study (Jerusalem, Beer-Sheva, Rishon-Lezion, Holon, and Ra'anana) operate a municipal emergency call centers which receive voice complaints from concerned citizens. The dataset consists of a registry of all complaints regarding local FRC problems during five consecutive years (2007–2011). These five cities accommodate a total population of approximately 1.42 million citizens in a total jurisdiction area of 335.2 km² (Table 1; 2008 population census, Central Bureau of Statistics, Israel). In all cities except Ra'anana only minor and sporadic TNR activities were conducted by the municipalities (Table 1). In Ra'anana, which is the smallest city by area and number of residents, a meticulous TNR program was implemented by the municipal Veterinary Services. This TNR program started in 2006 (one year before the beginning of the current study) and continued along the current investigation.

The municipal call centers were continuously available to each city's residents. For each complaint event, the following data were registered: time and date of call, location of the event, personal details of the complainant and complaint content. Each complaint event was allocated by the registry call center to a specific municipal department according to its content. FRC-related complaint events were allocated to either of two departments as follows: complaints regarding carcasses were allocated to the sanitation department, while complaints regarding all other cat-related issues were allocated to the veterinary department. All complaints were recorded from all five cities, during the years 2007–2011. The exception are missing data for Jerusalem from January 2007 and missing data for Holon during January to May, 2007. A computed data-mining of the general carcasses database was performed by using simple keyword algorithm (see Table 2). Then, only complaint records regarding cat carcasses were analyzed

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