Free-roaming dog populations: A cost-benefit model for different management options, applied to Abruzzo, Italy

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A B S T R A C T

Since 1991, Italian free-roaming dogs have been under government protection and euthanasia is restricted by law. Management measures are regulated at the regional level and include: kennelling, adoptions, conversion of stray dogs into block dogs, and population control of owned dogs. "Block dogs" are free-roaming dogs that have been collected by the veterinary services, microchipped, sterilised, vaccinated, and released under the responsibility of the local municipalities. The present paper describes a cost-benefit model for different management options and applies it to two provinces in Abruzzo, central Italy. The model considers welfare, nuisance and direct costs to the municipality. Welfare is quantified based on the expert opinions of 60 local veterinarians, who were asked to assign a score for each dog category according to the five freedoms: freedom from pain, physical discomfort, disease, fear, and freedom to express normal behaviour. Nuisance was assessed only for comparisons between management options, using the number of free-roaming dogs per inhabitant as a proxy indicator.

A community dog population model was constructed to predict the effect of management on the different subpopulations of dogs during a ten-year period. It is a user-friendly deterministic model in Excel, easily adaptable to different communities to assess the impact of their dog management policy on welfare, nuisance and direct monetary cost.

We present results for Teramo and Pescara provinces. Today's management system is compared to alternative models, which evaluate the effect of specific interventions. These include either a 10% yearly increase in kennel capacity, an increase in adoptions from kennels, a doubling of the capture of stray dogs, or a stabilisation of the owned dog population.

Results indicate that optimal management decisions are complex because welfare, nuisance and monetary costs may imply conflicting interventions. Nevertheless, they clearly indicate that management actions that would act on dog ownership patterns to reduce the number of free-roaming dogs would have the most favourable outcomes. These include reducing the reproductive capacity of the owned dog population, stronger enforcement of mandatory dog identification, reducing abandonment and increasing adoptions. This would increase welfare and free resources for implementing public campaigns. Block dogs may be an important intermediary means to reduce stray dogs, but adoption would be preferable.

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1. Introduction

Free-roaming dogs (FRD) are dogs that are not confined to a yard or house (Slater, 2001). In 1991, the Italian Parliament approved the National Law n. 281 "Companion Animals and the Prevention of Strays" which provides for

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government protection and assistance to FRD, and at the same time, forbids euthanasia of unwanted dogs unless "incurably ill or proven to be dangerous" (Italia, 1991). This challenges the system because kennels become overcrowded, and alternative options need to be considered (Dalla Villa et al., 2010; Voslarova and Passantino, 2012). One of these is the conversion of FRD into "block dogs" (BD), as currently foreseen by some regional regulations. BD are FRD that have been collected, microchipped, sterilised, vaccinated by the Local Veterinary Services (LVS), and then released back to the territory under the responsibility of the local municipalities. Other options include increasing kennel capacity, increasing adoptions from kennels, decreasing abandonment, and limiting the reproduction rate of owned dogs (OD).

When choosing the appropriate measures, a number of elements should be considered. One important aspect is dog welfare, which was the basis for the National Law n. 281 (Voslarova and Passantino, 2012). Recommendations in the 1965 UK Brambell Committee report were implemented in 1979 by the Farm Animal Welfare Committee (Farm Animal Welfare Committee, 1979). Henceforth, welfare in farm and companion animals is often assessed by the level to which the animals have access to "the five freedoms": 1. Freedom from hunger and thirst – by having ready access to fresh water and a diet to maintain full health and vigour. 2. Freedom from discomfort – by providing an appropriate environment including shelter and a comfortable resting area. 3. Freedom from pain, injury or disease – by prevention or rapid diagnosis and treatment. 4. Freedom to express normal behaviour – by providing sufficient space, proper facilities and company of the animal's own kind. 5. Freedom from fear and distress – by ensuring conditions and treatment which avoid mental suffering (Farm Animal Welfare Committee, 2011).

Nuisance to the community is another important aspect to consider. Problems traditionally associated with FRD include dog bites and attacks, transmission of diseases to human or pets, damage to property and wildlife, accidents, littering of public and private property, and noise pollution (Acosta-Jamett et al., 2010; Feldmann and Carding, 1973; Lunney et al., 2011).

Finally, the monetary costs of different options must be considered in the implementation of the programs.

To consider these aspects at the community level, an estimation of the dog community population dynamics is required. Such an approach is complex due to presence of multiple inter-relating compartments, and a scarcity of data. Teramo (TE) and Pescara (PE) are two contiguous provinces of the Abruzzo region, in which some key information to assess population dynamics is available from previous publications (Di Nardo et al., 2007; Slater, 2001; Slater et al., 2008b) and registries of the LVS. They follow the same regulations, which are established at the regional level, and are similar enough to be considered as one epidemiological unit for the present study. In an interview performed in TE in 2004, 90% of the respondents believed that FRD were a problem (Slater et al., 2008a). Personal safety was the most commonly cited problem, followed by animal welfare, public health and environmental sanitation (Slater et al., 2008a).

In the present paper, we compared different management options with regard to dog welfare, public nuisance and direct costs to the municipality in TE and PE. We estimated parameters of population dynamics from existing literature and expert consultations, and built a spreadsheet model to describe the dynamics of four subpopulations of dogs: owned dogs (OD), kennel dogs (KD), block dogs (BD) and stray dogs (SD). The model was used to assess the impact of different management options on the sizes of these compartments over a tenyear period, and the resulting impact at the community level.

2. Materials and methods

2.1. Study area

Teramo (TE) and Pescara (PE) are two contiguous provinces of the Abruzzo region from which complementary data were available. They have respectively 47 and 46 municipalities and 287,411 and 295,481 inhabitants (ISTAT, 2001) and the territory has an area of 1948 km^2 (TE) and 1224 km^2 (PE). They follow the same regulations on dog population management, are similar in geography, population and culture, and were therefore considered an appropriate epidemiological unit for applying the present model.

2.2. Dog subpopulations

We classified dogs into four subpopulations: 1. "Owned dogs" (OD), owned by private individuals and identifiable to their owner. The fraction that roams freely outdoors unsupervised by their owner was called "Free-roaming owned dogs" (FreeOD) 2. "Kennel dogs" (KD), confined to a private or municipal shelter and unable to roam 3. "Block dogs" (BD), which are FRD under the responsibility of the community, identified and sterilised and 4. "Stray dogs" (SD), free-roaming dogs untraceable to any owner, including feral dogs.

The FRD thus consist of FreeOD, BD and SD.

2.3. Welfare assessment

To quantify welfare of the different dog subpopulations, expert opinions were obtained from 60 veterinarians in TE and PE, of which 7 worked in LVS and 53 worked as private practitioners. They were asked to score each subpopulation of dogs (OD, KD, BD and SD), according to each of the five freedoms, as defined by the Farm Animal Welfare Committee (Farm Animal Welfare Committee, 1979, 2011): 1. Freedom from hunger and thirst, 2. Freedom from discomfort, 3. Freedom from pain, injury or disease, 4. Freedom to express normal behaviour, and 5. Freedom from fear and distress. They were asked to score each category from one to five, where one was the lowest and five the highest welfare score. No further criteria for assigning scores were defined.