Preliminary Observations on the Characteristics of the Owned Dog Population in Roseau, Dominica

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This article reports findings from interviews with 93 heads of households (38.6% of all households) who owned 148 dogs in Roseau, the capital of The Commonwealth of Dominica. Mixed dogs, of no definable cross, were most common, followed by Rottweiler crosses. The median age of the dogs was 3 years, and 9.4% of the population was over 7 years. Respondents showed a definite preference for keeping male dogs (60%), and most animals were kept for protection (65%). Almost 30% of the dogs were allowed to roam. With 8.5% of the dogs neutered and 7 puppies per litter being born, the owned population produces more dogs than are required to maintain its size and so can provide recruits to the “stray” dog population. Comparisons with studies elsewhere in the Caribbean region (Fielding & Plumridge, 2005; Ortega-Pacheco et al. in press) suggest that environmental effects rather than the level of care offered are primarily responsible for controlling the dog population.

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Although dog ownership has a long history in the Caribbean from the native Indians onward (Fielding, Mather, & Isaacs, 2005; Schwartz, 1997), few studies have attempted to examine the dynamics of local dog populations. Notable exceptions to this in the Caribbean are from St. Maarten (Romney, 2004); The Bahamas (Fielding & Plumridge, 2005); and the Yucatan, Mexico (Ortega-Pacheco et al., in press).

Dominica is one of the less-developed Leeward Islands with a gross dog population. The per capita income of Dominica is U.S.$5,500 (Work Fact Book, 2006), which ranks it 9th of the 11 Caribbean member states of the Caribbean Community and Common Market (Wikipedia, 2006). The attitudes and knowledge of companion animal care, as well as the recognition of there being a “stray dog problem” in Roseau, the capital of Dominica, indicates the need for educating caregivers on improved pet care (Alie, Davis, Fielding, & Galindo, in press). Although the two veterinary clinics in Roseau allow caregivers to offer health care to their dogs and at the same time receive education on pet care, this can happen only if caregivers choose to—or are able to—visit the veterinarian. Consequently, there is a need to take education more actively to caregivers.

The need for information on dog populations has become important regionally as roaming dogs are now a common occurrence in many Caribbean islands (Fielding, 2004). In Dominica, the estimated 3,000 to 4,000 dogs are considered to be a threat to public health and tourism (Alie et al., in press). In Antigua, roaming dogs have been found to be vectors of zoonotic diseases: Toxocara canis, Ancylostoma caninum, Ancylostoma braziliensi, Entamoeba histolytica, and E. histolytica (Dipeolu, 2006), so these diseases could be present in Dominica’s dog population.

In some other Caribbean societies, spay or neuter programs have been undertaken without establishing the perceptions of dog guardians (owners) toward neutering their animals (Fielding, Samuels, & Mather, 2002) or establishing the size of the undertaking (Humane Society International, 2001). Such omissions can lead to programs not including all appropriate caregivers or to programs being inadequately resourced. Given the unique environment of each Caribbean territory, it is necessary to characterize each local dog population as it cannot be assumed that each population is similar.

Superficially, the dog populations may appear to have similarities: A high number of islands reported pit bulls as the most popular “breed” (Fielding, 2004). However, care practices—such as neutering, whether dogs are kept inside or outside the home, and attitudes toward pets—may vary (Fielding & Plumridge; 2005; Ortega-Pacheco et al., in press). From our discussions with participants in regional meetings on animal welfare and as has been noted in Fielding et al. (2005), it seems to be generally accepted that the roaming-dog population contains many loose, owned dogs and few homeless, roaming dogs; consequently, there may be little
distinction between these two populations. This observation alone may be a cause for concern with respect to pet care, especially as the interaction of loose dogs can result in unwanted litters.

These observations alone make a clear case for the need to have information on the owned-dog population with respect to the daily care and level of health care offered. Without such information and awareness of cultural sensitivities, the effect of an education program may be diminished. In 2004, a study was undertaken to characterize the owned-dog population and to provide information for an animal control program and an educational program directed at caregivers.

**METHOD**

To assess the dog-keeping practices of residents within the city, a survey was conducted in October and November 2004. The survey targeted 300 households that represented a 6.3% sample of those in the capital city of Roseau. The same 6.3% sample proportion was applied to each enumeration district. A systematic random sample was selected using a list from the 2001 census. Following this process, 315 households were selected from the city of Roseau.

The questionnaire was based on the format recommended by World Society for the Protection of Animals/World Health Organization (1991). After modifying the questions to incorporate local issues and parlance, the form was piloted and a workshop held for enumerators. Ten local enumerators who were experienced interviewers administered questionnaires to the selected households. Heads of households were interviewed in face-to-face, structured interviews. The survey gathered information on how households cared for their dogs and information about each dog. Of the sample of 315 households, 93 owned 148 dogs in total. In some cases, incomplete information was provided on each dog. When the number of responses is not 148, the number of dogs is indicated. The results are presented on a per-dog basis rather than a per-household basis because not all dogs within a Caribbean household are necessarily kept in the same way (Fielding & Plumridge, 2005).

**RESULTS**

Data were collected on 148 dogs from 38.6% (93 households) of all the 315 households sampled. Ownership per household was skewed, with 29.7% of all dogs being kept by only 13% of all households. The mean number of dogs per house was 0.61 ($SE = 0.061$), and the mean number of dogs in dog-keeping households was 1.59 ($SE = 0.091$).
Population Demographic

The mean age of all dogs was 3.5 years ($SE = 0.256$) with a median of 3 years (range = 0.2–16 years); 9.4% of the population was 7 years or more in age. If we ignore 3 dogs with a reported age of 16 years (from our experience we feel that such ages are unlikely given the level of care offered), the mortality of dogs aged 1 or more is consistent with a survival rate of 72% each year, $\chi^2(10, N = 148) = 13.9, p = .18$. There was a real preference for keeping male rather than female dogs, as 59.5% of the dog population was male (binomial test, $p = .026$).

Most dogs were kept to protect the home (64.9%) and/or as pets (51.4%), 0.7% were kept for hunting, and none were kept for fighting. “Breed” information was reported for 148 dogs. Of these, mongrels were the most common (46.3%). Pit bulls were the most common breed (8.2%), followed by Dobermans (4.1%), Rottweilers (3.4%), and German shepherds (2.7%). The remainder were “others,” most of whom (32.6% of 47 replies) were Rottweiler mixes.

Housing Practices

Most dogs (70.3%) were confined in the yard day and night, 20.9% were never confined, and the remainder were either confined during the day or night. Many dogs (36.6%; $n = 145$) were merely confined to the yard or house without being tied, and 26.2% were tied both day and night. Of the remainder, 20.0% could roam in and out of the yard, and the rest were tied either during the day or night.

Daily Care

Not all dogs were fed daily by their household, although 92.6% were fed at least once a day, 4.1% were fed every other day, and 3.4% were fed at other frequencies. Most dogs (84.5%) were fed by “anyone in the house,” 2% were fed by neighbors, 0.7% “found their own food,” and the remainder were fed by some other means. Most dogs (75%) were fed home-cooked dog food; 23%, commercial dog food; 11.5%, table scraps; 1.4%, raw meat; and 2.7%, “other” food. Most dogs (93.9%) had daily access to water, but 2.7% did not. The answer was not known for the remaining dogs. Two of the 36 dogs (5.6%) who were tied day and night did not have “easy access” to water. In the case of handling, playing with, and grooming the dogs, not all the dogs were exposed to these activities as nobody or unknown persons handled 5.4% of the dogs.
Health Care

Only 12.8% had received a standard combined canine DHLPP (Distemper, Hepatitis [CAV–2], Leptospirosis, Parainfluenza, Parvovirus) vaccination. Many dogs were not vaccinated at all (27.7%), and this percentage may be higher, as many caregivers could not recall whether another 56.1% of dogs were vaccinated or knew against what they had been vaccinated (Table 1). Respondents could not state the age at which 51.3% of the dogs were last vaccinated, and only 46 dogs (n = 115) had been vaccinated in the previous 12 months. It would appear that most dogs are at risk due to inadequate vaccination. Many dogs (40.5%) were dewormed “when needed,” but 16.9% of dogs had never been dewormed, 18.9% were regularly dewormed (10.1% every other month and 8.8% every year), and 20.3% according to some “other” frequency.

Source of Dogs

Fewer than 20% of dogs were acquired through buying or trading, and most were acquired as “gifts” (Table 2). This observation, combined with the information in Table 3, suggests that these gifts were excess dogs whom caregivers gave away, as few reported keeping puppies from litters of their own dogs.

Breeding

Of the adult dogs (animals 6 months old or more), 5 females and 6 males (8.5%, n = 130) of the adult population were neutered. The reasons for neutering

<table>
<thead>
<tr>
<th>Vaccination</th>
<th>Dogs Immunized (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaccinated for something, not sure</td>
<td>29.7</td>
</tr>
<tr>
<td>No vaccination</td>
<td>27.7</td>
</tr>
<tr>
<td>Do not know</td>
<td>16.4</td>
</tr>
<tr>
<td>Vaccinated with DHLPP*</td>
<td>12.8</td>
</tr>
<tr>
<td>Rabies</td>
<td>10.1</td>
</tr>
<tr>
<td>Distemper</td>
<td>6.1</td>
</tr>
<tr>
<td>Leptospirosis</td>
<td>6.1</td>
</tr>
<tr>
<td>Canine hepatitis</td>
<td>5.4</td>
</tr>
</tbody>
</table>

*Note: Combined canine vaccine—Distemper, Hepatitis [CAV–2], Leptospirosis, Parainfluenza, Parvovirus
centered on not wanting the dog to breed (6 of 11 dogs) and being unable to find good homes for puppies (2 dogs). One dog was neutered because she was “too old,” presumably, to breed; however, this response was not clarified.

The study included 50 females of breeding age (6 months or older), of whom 44 (88%) were intact. In the previous 12 months, 13 females had a total of 15 litters; none of the females had been spayed after this whelping. The mean litter size of the previous litter (not necessarily in the previous 12 months) was 7.0 (SE = 0.68, n = 23), of which less than one (0.74, SE = 0.36, n = 23) was still in the household. Most of the puppies (63.0%; n = 171) were given away or sold. No respondent admitted to abandoning puppies (Table 3). Four (8.0%) of 50 females and 6.6% of 76 males were bred for the sale of their puppies.

The data from Table 3 and the estimated mortality rate within the adult population were combined to provide an account of the effect of births and deaths on the population in 1 year (Table 4). These calculations indicate that the final population at the end of the year would be about 30% more than at the beginning, assuming no migration.

<table>
<thead>
<tr>
<th>Fate of Puppies</th>
<th>Total</th>
<th>% of Total Born</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. born</td>
<td>171</td>
<td>100</td>
</tr>
<tr>
<td>Given away or sold</td>
<td>108</td>
<td>63</td>
</tr>
<tr>
<td>Still with household</td>
<td>21</td>
<td>12</td>
</tr>
<tr>
<td>Died from diseases</td>
<td>17</td>
<td>10</td>
</tr>
<tr>
<td>Killed by puppy’s mother</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Killed by people</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Unaccounted for</td>
<td>12</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 2: Source of 148 Dogs in Roseau

Table 3: Fate of Puppies From the Previous Litter of Owned Dogs in Roseau
DISCUSSION

It should be noted that the study only included 148 dogs in 93 households. Despite the limited number of dogs found in the study, the households were a random section of 6.3% of households in Roseau. Thus, the methodology should have resulted in a representative selection of dog-keeping households and dogs, allow for extrapolation of results to the wider dog population in Roseau, and permit at least a preliminary assessment of the owned-dog population to be made.

Most dogs were kept not as pets but for protection. Although this finding is similar to that found in The Bahamas (Fielding & Plumridge, 2004), it contrasts with the situation in North America and Europe, for example, New et al. (2004). Although dogs may be kept for protection, they may not always provide the security caregivers imagine (Fielding & Plumridge, 2004); such dogs, when not properly trained and confined, may be a threat to families and the community (Burrows, Fielding, & Mather, 2004). In addition, using dogs for protection can put dogs at risk of being intentionally harmed by criminals.

Day-to-day care of dogs appears to be ad hoc and not a result of designated responsibility. This may result in dogs receiving less than adequate care if there are misunderstandings within the household as to who should care for the animals. Feeding dogs home-produced food without consideration of nutritional requirements may result in the dogs having an inappropriate diet. Owned dogs in Roseau have been found to be malnourished and/or anemic (M. Morters & M. Smith-Blackmore, personal communication, November 13, 2005). All the dogs were not fed each day, and this may suggest that some are being neglected. Although water was accessible to most dogs, the data suggest that some animals may be caused hardship through inadequate access to water in a hot climate. With over 5% of the dogs never being played with by anyone confirms the “passive ownership” suggested by Alie et al. (in press).

PRELIMINARY OBSERVATIONS OF OWNED DOGS

TABLE 4
Breeding and Estimated Mortality of Owned Dogs in Roseau

<table>
<thead>
<tr>
<th>Number of Dogs</th>
<th>Total</th>
<th>Male</th>
<th>Female</th>
<th>Opening Balance (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening population</td>
<td>148</td>
<td>88</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>Estimated number of deaths</td>
<td>41.44</td>
<td>24.64</td>
<td>16.8</td>
<td>28</td>
</tr>
<tr>
<td>Number of females breeding</td>
<td>13</td>
<td>—</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Estimated number of puppies survivinga</td>
<td>83.7</td>
<td>41.9</td>
<td>41.9</td>
<td></td>
</tr>
<tr>
<td>Final population</td>
<td>190.26</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
</tbody>
</table>

aThis does not take into account any intentional selection for male puppies that may occur.
About one quarter of the dogs were tied. This practice may be a cause for concern because other studies have shown that tied dogs are associated with a disproportionate number of fatal attacks on humans (Gershman, Sacks, & Wright, 1994). Given the high percentage of Rottweiler mixes in the dog population and their association with fatal attacks (Sack, Sinclair, Gilchrist, Golab, & Lockwood, 2000), dog keepers may unwittingly be putting society and themselves at risk by confining dogs through tying. Why caregivers tie their dogs would be a useful avenue for further investigation: Is this action temperament driven or a cheap form of confinement? Answering this question will help the development of an appropriate antitying education program.

Because many dogs were not vaccinated, and 22.8% of owners never took their pet to a veterinarian (Alie et al., in press), it appears that the health care offered many dogs is a cause for concern. It should be noted that results from a small-scale study indicated that Dominica appeared to be free of heartworm (R. Thomas & M. Morters, personal communication, November 2005) and canine distemper (R. Thomas & M. Morters, personal communication, November 2005). However, venereal tumors, leptospirosis, and parvovirus were present (R. Thomas, personal communication, November 2005). In St. Lucia, arthropod-transmitted infectious diseases, such as *Ehrlichia* spp., *Leishmania* spp., *Rickettsia* spp., *Bartonella* spp. or *Babesia* spp. have been identified with stray dogs, so indicating that they also pose a potential health threat (Witt, Shaw, Tasker, Steeves, & Neiger, 2006). The lack of health care may contribute to the median age being only 3 years; it should be noted that elsewhere in the Caribbean a similar average age has been found with a different mix of health issues but where health care can also be a concern (Fielding et al., 2005).

Caregivers did not report abandoning any dogs. This contrasts with other Caribbean communities: The Bahamas (Fielding et al., 2005), and the Yucatan (Ortega-Pacheco et al., in press). This could suggest that females may not be preferentially abandoned but preferentially killed. If few dogs are abandoned, this would suggest that roaming dogs are often owned, roaming dogs rather than homeless ones. This is possible as many dogs are not confined all the time.

The lack of confinement is not unique to the Caribbean; rather, it appears to be common in less-developed countries (Hsu, Severinghaus, & Serpell, 2003). However, the fact that some owners adopted dogs from the street suggests that there are uncared-for dogs who may have been passively, if not actively, abandoned. It is always possible that caregivers were not completely honest concerning abandonment or that animals living on the streets are the offspring of a few abandoned animals who have bred with owned, roaming dogs. The clear preference for keeping male dogs raises the issue of the fate of unwanted female puppies and dogs. From Table 3, it can be seen that 7% of the puppies born apparently were not accounted for. If this apparent discrepancy is not purely statistical, it could explain...
the male-to-female ratio in the owned population—if they were all females. These “missing” puppies could be females who were killed or abandoned. A line-transect estimate of roaming dogs found that only 25% of the dogs were female \( (n = 203; \text{Alie, Ramanathan, & Davis, 2004}) \).

With 5% of puppies being killed by caregivers, it is clear that animals could be subjected to acts of cruelty, depending on how they are killed. These deaths also indicate that unwanted puppies are being produced, presumably as a result of unplanned breeding.

Although few dogs were neutered, only a minority of dogs actually bred successfully each year. This observation conflicts with a perception that dogs breed frequently (Fielding et al., 2005). Although dogs can breed year round, individual dogs do not necessarily breed regularly. In this study, only 2 of the 13 dogs who had bred had had two litters in the previous 12 months. Despite the relatively small number of dogs whelping, the number of surviving puppies still exceeds the population mortality, so allowing the population to grow. To bring the population into balance, only 7.4 litters would be required, not the 15 observed in a single year. Given the population of females at risk from breeding (54 of 60) and the probability of a female to produce litters (15 of 54), we can estimate that at least 56% of the females should be spayed. Thus, if neutering programs can control dog populations (Frank & Carlisle-Frank, 2005), at least 56% of female dogs would need to be spayed to bring this population in balance. Despite a much higher neutering rate in The Bahamas (36.1%; Fielding & Plumridge, 2005), a similar percentage of spayed females would be required to stabilize the population (Fielding & Plumridge, 2005). This suggests that when neutering rates are far from the required level, natural environmental factors—not care practices—are the effective constraint on the population.

Implications of the Study

The study highlights several areas on which animal welfare education programs must concentrate. It is clear that the humane disposal of unwanted animals must be stressed, as many animals appear to be destroyed other than by euthanasia. Day-to-day care of animals appears to be unstructured, which can lead to neglect. Confinement through tying dogs may not be the best method of restraint, and caregivers should be encouraged to alter this practice. Caregivers should be encouraged to increase the level of health care offered. The study indicates that the lack of neutering and confinement allows too many dogs to breed and so leads to overpopulation. Controlled breeding is required to bring the population into balance. Caregivers should be discouraged from “giving away” surplus
animals as there is no guarantee that they are passing the dogs to caregivers who will be responsible.

The limited scale of this study prevents more detailed analysis. Further studies that include more dog-owning households would be required to examine differences in dog-keeping practices due to household characteristics, gender affects, and dog breeds to ensure that educational posters are appropriately devised.

ACKNOWLEDGMENTS

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REFERENCES


