2014

Baseline Surveys in Mauritius for Street Dog Management

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Baseline Surveys in Mauritius for Street Dog Management - 2013

Project Report, ver. 2

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14 March, 2014

TABLE OF CONTENTS

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SUMMARY

In June-July 2013 and December 2013, Humane Society International (HSI), in conjunction with partner organizations, conducted a series of surveys in the nation of Mauritius to characterize its street dog population, owned dog population, human practices toward dogs, and attitudes about humane issues. Based on data from these surveys, we estimated that Mauritius has a total owned dog population of approximately 246,000, and a roaming street dog population of approximately 57,000. Several indicators suggest that a large majority of the street dog population in Mauritius is owned, and that the number of truly stray dogs is relatively low. Sterilization rates for owned dogs and street dogs were approximately 30%, well below the sterilization rate of 65% - 70% that is necessary to reduce reproductive capacity below replacement levels and achieve population size reduction over time. The failure to sterilize owned dogs is primarily a function of the widely held perception in Mauritius that sterilization is "not necessary". Despite this attitude, the Mauritian public expressed a broadly-held dissatisfaction with current street dog density, identified many problems and inconveniences associated with street dogs, and expressed overwhelming support for a systematic and effective street dog management program. The apparent disconnect between the desire to reduce street dog numbers versus the actions of individual dog owners emphasizes the need for effective humane education within the framework of an integrated dog management program. Such a program, if properly designed and implemented, would gradually reduce the number of street dogs over time, improve the quality of life for Mauritius's street dogs, and reduce the problems caused by street dogs. The surveys discussed in this report establish a baseline against which future progress can be measured and evaluated, and provide information that is critical in designing an effective humane street dog management program in Mauritius.

ACKNOWLEDGMENTS

NOTE ON VERSION 2

This report is an updated version of the initial project report (ver. 1) that was generated in December 2013. Version 2 differs from the original report in that it incorporates findings from a door-to-door survey of Mauritius residents that was conducted in December, 2013, after the production of the first version of the report.

INTRODUCTION AND PURPOSE

The Republic of Mauritius is an island nation of 1.25 million inhabitants located in the southwestern Indian Ocean off the eastern coast of Africa. Freely-roaming dogs are common in Mauritius, and for many years, periodic culling campaigns were undertaken by the government in an attempt to reduce their numbers. From 2007-2010, this program was conducted at a cost of Rs 18M (approximately $590,000 USD), but little if any persistent reduction in the number of street dogs was observed as a consequence of these efforts. As a result, the government of Mauritius agreed to partner with Humane Society International (HSI) and a local Mauritian animal-welfare organization (PAWS) to implement a humane, nation-wide dog management program as an alternative to culling. Although the details of this program are still being developed, it is likely to involve an initial phase characterized by intensive sterilization efforts (considerably greater than the sterilization efforts that have occurred previously), followed by a less intensive, long-term maintenance phase. HSI has recognized that before beginning this intensive management program, it is critically important to obtain a baseline assessment of the street dog population in Mauritius, which serves several important functions. First, by producing a street dog population size estimate, the scope of the "problem" we are attempted to address can be quantified. Second, quantifying the problem allows us to make an informed estimate of the resources and the timeline required to achieve the desired outcomes. Finally, a baseline assessment functions as a yardstick against which to measure progress as the dog management program moves forward.

This document describes survey work that was conducted by HSI and its partner organizations in Mauritius to generate a baseline assessment. This work included a series of dog counting surveys that occurred in June-July 2013, and door-to-door surveys of Mauritius residents that were conducted in December 2013. This report is intended to highlight the main design features of the surveys and their most relevant and useful results. Additional technical details regarding survey design and data analysis that are not covered in this report are available in a companion HSI report entitled "Baseline Surveys in Mauritius for Street Dog Management - 2013 – Technical Supplement, ver. 2" (hereafter, "Technical Supplement").

Mauritius represents a valuable opportunity for coordinated street dog management for several compelling reasons:

1) The management effort will operate nation-wide across a large island. Therefore, concerns that are typically encountered in management areas about the potential influence of "outside" dogs on the target population are largely eliminated, and the effects of the management program can be monitored and assessed with fewer complicating factors to consider.
2) Because the baseline survey has been conducted before the initiation of large scale sterilization efforts, there is good "pre-treatment" data, which ultimately facilitates the analysis of program impact. Additionally, there is an opportunity to design a strong monitoring program as an integral component of the ongoing management program, rather than addressing monitoring as an afterthought.
3) Both the government of Mauritius and a well-established local NGO (PAWS) have demonstrated a strong commitment to a humane dog management program, and have made significant resources and support available. This suggests an excellent prospect for program sustainability.

All of these factors generate confidence that Mauritius could serve as an excellent case-study for large-scale, integrated, cooperative, and scientifically-robust humane management program for street dogs.

SURVEY DESIGN

We conducted both "dog surveys", which involve counting dogs directly using the methods described below, and "door-to-door surveys", which involve administering questionnaires about pets and animal-related issues to Mauritian households. The dog surveys specifically targeted "street dogs", which are defined as unconfined freely-roaming dogs that are present in and around human settlements, regardless of their ownership status. The dog surveys inherently exclude dogs that are confined within or around houses and truly feral dogs that may be present away from human population concentrations. Door-to-door (DD) surveys, in contrast, focus on "owned" dogs, regardless of their confinement status. To the extent that street dogs are also owned dogs, these two survey approaches overlapped with regard to the dog population segments that they targeted.

It is not necessary to count all of the dogs in Mauritius or to survey all the households to generate a good baseline assessment. Instead, the surveys took the form of a sampling exercise, with results from selected survey areas being extrapolated across the entire island in order to generate nation-wide estimates. More specifically, we used an approach called "stratified random sampling", which is widely used in wildlife survey work and in public opinion polling. In brief, stratified random sampling involves: 1) dividing the assessment area into survey plots, 2) classifying the plots according to one or more factors that we believe may influence street dog

density and distribution, and 3) surveying a random subset of plots within each unique classification type, or "stratum". This approach typically maximizes the amount of useful information that can be obtained for a given amount of survey effort, and ensures that the overall sample is representative of the entire area of interest.

Mauritius was divided into 201 sample plots that collectively encompassed every formally-designated human settlement on the island. Plot boundaries were in most cases drawn to correspond to established municipality boundaries or established ward boundaries within larger cities. However, in order to keep plot size relatively consistent, some larger municipalities were subdivided into two or more plots, and some smaller municipalities were combined into a single contiguous plot. Each plot was classified (i.e. stratified) according to its human population size (small = <5,000 people; medium = 5,000–12,000 people; large = >12,000 people), its geographical position (coastal or inland), and the District within which it was located. Of the 201 plots, 44 were randomly selected for dog surveys (see Figure 1 and Appendix 1), subject to the constraint that every stratum be represented with sufficient sample size. DD surveys were conducted on the 39 of the dog survey plots, plus three additional "substitute" plots (five of the original plots used for dog surveys were dropped for logistical reasons) for a total of 42 plots (Appendix 1).

Additional details about stratified random sampling and how it was implemented on Mauritius are provided in the Technical Supplement.

SURVEY METHODS

Dogs were counted on the selected plots using two different survey methods: 1) simple dog counts and 2) mark-recapture counts. The simple dog count is a "rapid" survey method that requires surveyors to walk (or cycle) along roads within a plot at a relaxed pace, counting dogs as they travel along their survey route. It is understood that this method detects only a subset of the street dogs that are actually present within the survey plot. The mark-recapture count is a more time-consuming process that occurs over two different days. Dogs that are observed within the survey plot on the first day are temporarily marked in a visible location on their body using paint sprayers, and the total number of marked dogs is tallied. On the second day, surveyors count the dogs that they observe and note whether each dog is marked or unmarked. The day 2 mark-recapture count, by itself, is analogous to a simple dog count, and can be used in that capacity. Additionally, by entering the number of marked (M) and unmarked (U) dogs observed on day 2 and the total number of dogs marked on day 1 (TM) into the mathematical formula (TMM+U))/M = T, a population size estimate (T) for the survey plot can be derived.

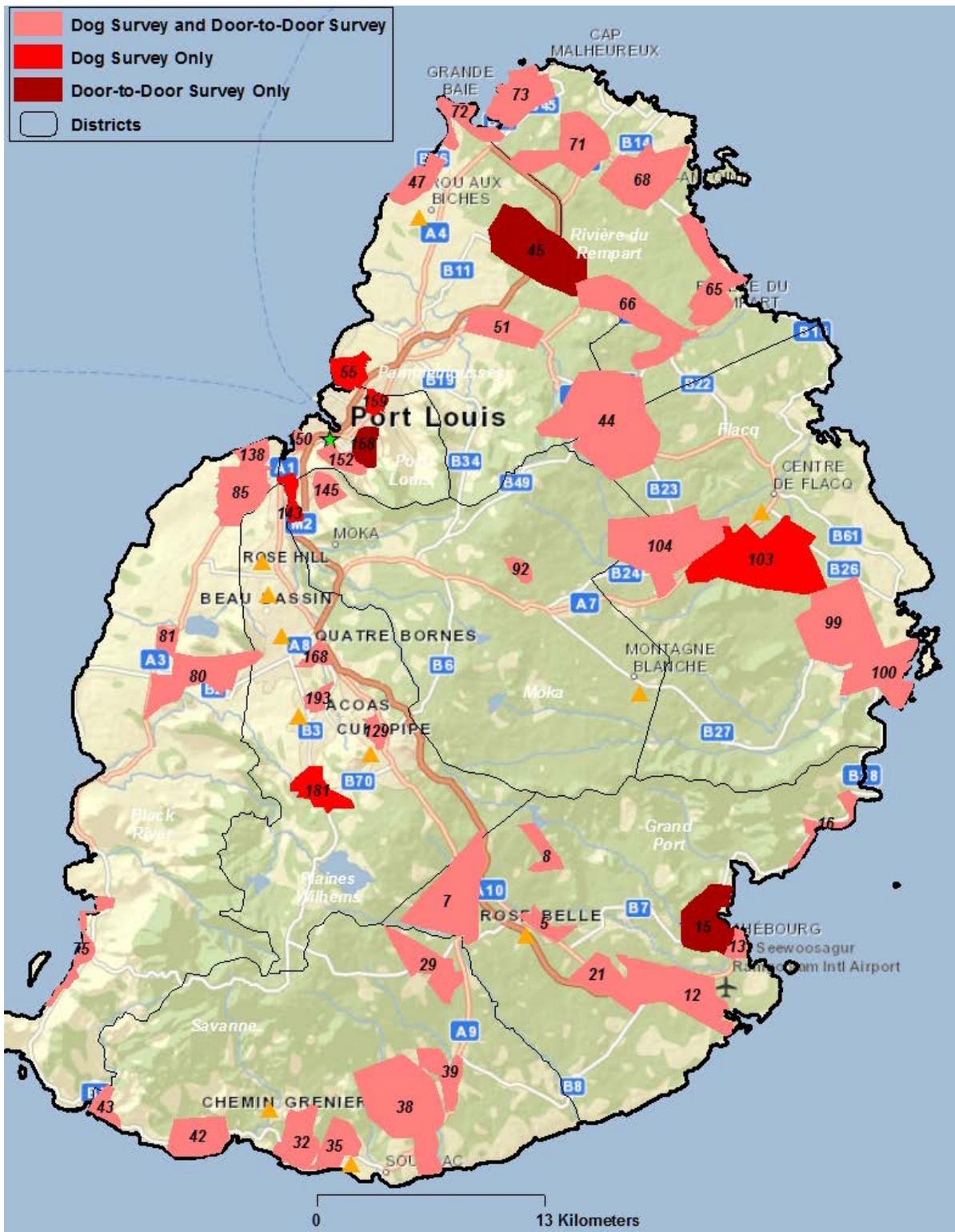**Figure 1.** Location and extent of 44 selected dog survey plots (out of 201 total plots) and 42 selected door-to-door survey plots on Mauritius, labeled by plot number. Characteristics of each plot are shown in Appendix 1.

Combining simple dog counts with mark-recapture counts (or some other intensive survey method) provides a good balance of broad geographical sampling coverage and the detailed information collection that is required in order to generate a population size estimate.

For DD surveys, a standardized questionnaire was developed (shown in Appendix 2), and survey teams attempted to obtain full questionnaire responses from 20 households per plot, with 16 households being the minimum acceptable level. Although the scope of this project did not allow for an analytically rigorous household selection procedure within plots to be implemented, we did develop a rule set for house selection (described in the Technical Supplement) that ensured that the sampled households were distributed relatively evenly across the entire plot.

Further details about the survey methods used, including full survey protocols, mark-recapture calculations, and a discussion of the assumptions and limitations of the mark-recapture method, are provided in the Technical Supplement.

DATA COMPUTATION AND ANALYSIS

To generate a population size estimate for street dogs using dog survey data, the raw data collected had to be transformed and extrapolated appropriately. This process is described in detail in the Technical Supplement, but in brief, the steps involved were as follows:

1) When surveyors could not cover all roads within a plot due to time constraints or access limitations, the simple counts they obtained were extrapolated to the unsurveyed roads in the plot. This process required standardizing the dog counts based on road distance (i.e. dogs / km over the survey route).
2) By comparing simple counts to mark-recapture population size estimates for plots in which both methods were performed, we could estimate the proportion of dogs within a plot that are typically observed during simple counts. This allowed us to adjust the simple counts in areas where mark-recapture counts did not occur to account for the expected number of uncounted dogs.
3) Plot-based population size estimates were standardized within each stratum in several alternative ways: dog density as a function of human population size; dog density as a function of road distance; dog density as a function of geographical area; and dog density per plot. By applying these standardized density estimates for each stratum to unsurveyed plots within that same stratum, population size estimates could be produced for all plots.
4) Overall population size estimates for each stratum were combined to produce an island-wide population size estimate.

Extrapolation of DD survey results proceeded in a similar fashion. Results from the sampled households were extrapolated to the remainder of the human population of the same plot, which

was derived from census data. Averaged responses for each stratum within the sampled plots were calculated and standardized for human population size, and then applied to unsurveyed plots according to their stratum and their human population.

RESULTS AND DISCUSSION

Summary Statistics and Timeline

Between 14 June and 31 July, 2013, simple dog surveys were conducted in 28 plots, and mark-recapture dog surveys that also incorporated a simple dog count, as previously described, were conducted in 16 additional plots. A total of 3,313 dogs were directly counted during these surveys. DD surveys were conducted on 41 plots during 13–20 December, 2013, and one additional plot that had been missed earlier was surveyed on 24 January, 2014. Responses were obtained from 805 different households with a total of 3,819 residents (0.3% of the total Mauritian human population). Collectively, these households claimed ownership of 744 dogs.

Population Size Estimates

Using dog survey data and the methods described above, we estimate that there are approximately 57,000 street dogs in Mauritius, which is equivalent to 4.55 street dogs for every 100 human residents. This estimate does not include owned dogs that are completely or predominantly confined in houses or yards; it only includes freely-roaming dogs that occur in proximity to human settlement. However, as a general rule most street dogs are associated with human habitation and relatively few are truly feral.

Using DD survey data and the methods described above, we estimate that there are approximately 242,000 - 250,000 owned dogs on Mauritius (equivalent to 19-20 owned dogs for every 100 human residents). Approximately 22% of owned dogs are free to roam according to DD results, suggesting an owned street dog population of 54,000. Because dog surveys and DD surveys have different sources of sampling error (described more fully in the Technical Supplement), it is not appropriate to make precise quantitative comparisons between their respective estimates, but in more qualitative terms, the results suggest that a very high proportion of street dogs in Mauritius are owned, a conclusion that is tentatively supported by the very low frequency of poor body condition in street dogs (1.3%) as determined by qualified surveyors (i.e. veterinarians) during the course of dog surveys (see below). Results of our DD surveys correspond relatively well to a smaller questionnaire-based survey effort that was commissioned by the Mauritius Ministry of Tourism and Leisure and conducted in 2011, which reached the conclusion that there were approximately 200,000 dogs of all types in Mauritius.

In previous work, HSI has noted that the number of street dogs per 100 human residents tends to decline as the density of the human population increases. In other words, although there may be a larger absolute density of street dogs in more densely populated cities, there are fewer street dogs per 100 people in larger cities than there are in less densely populated areas. We graphically examined whether this relationship also occurred in Mauritius by plotting the human population density of each of Mauritius's nine districts against the average street dog / person ratio within that same district (Figure 2). Although this is a relatively coarse-scale presentation, the previously-observed relationship between human density and the dog / human ratio appears to hold in Mauritius at the district level, with the exception of the Port Louis District, which did not adhere to this pattern for unknown reasons. Although we have not yet done so, it would be possible to examine these relationships at the finer-grained plot level, which might help to elucidate the atypical pattern observed within the Port Louis District at the District level.
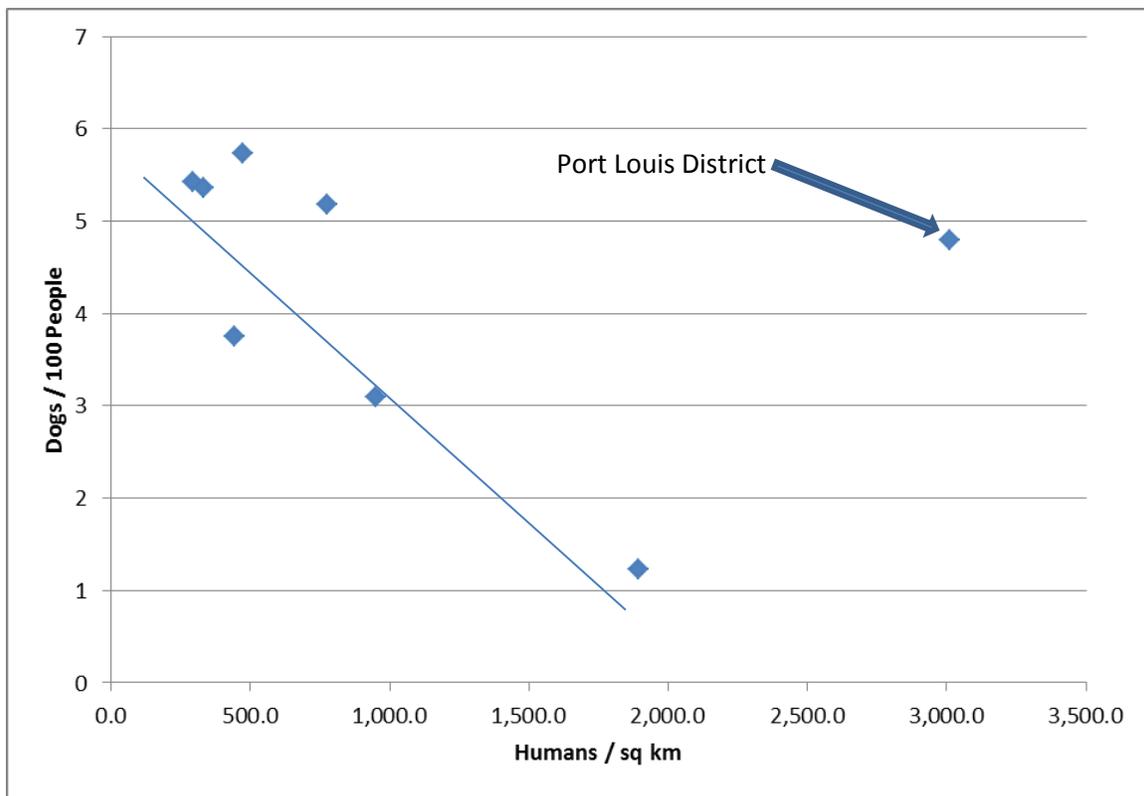
Figure 2. Plot of the relationship between street dog density per person and human density. Each blue diamond is the average plot-level number of dogs / 100 people in one of Mauritius's districts (Moka District not shown due to insufficient sample size). The right-most diamond (labeled with arrow) is the Port Louis District, which is an exception to the overall pattern.

Several statistical and sampling issues that merit consideration when interpreting the results of these surveys, particularly in relation to population size estimates, are discussed in the Technical Supplement.

Other Findings from Dog Surveys

Coastal municipalities had 36% more street dogs per person than inland areas, and smaller towns (< 5,000 residents) had approximately 75% more street dogs per person than medium-size towns (5,000 – 12,000 residents) or larger cities (> 12,000 residents), as shown in the table below.

	Town / City Location		Municipality Human Population Size		
	Coastal	Inland	Small (<5,000)	Medium (5,000 – 12,000)	Large (> 12,000)
Number street dogs / 100 persons	6.5	4.8	7.4	4.0	4.4

The number of male street dogs identified during dog surveys was larger than the number of female street dogs; specifically, 1.63 males were identified for every female. To some extent, this result might occur because male dogs are easier to positively identify at a distance than female dogs, especially for relatively inexperienced surveyors. To explore this possibility, we compared the sex ratios obtained from the mark-recapture counts (which were conducted by experienced veterinarians and dog surveyors) and simple dog counts (which were conducted mostly by volunteers). Sex ratios from the two survey methods were nearly identical (1.64 and 1.61 males per female, respectively), suggesting that the observed sex bias is real, probably as a result of artificial selection for male puppies on Mauritius. In addition, a preliminary analysis suggests that poorer areas may have more street dogs per person than more affluent areas, and that areas with large Muslim populations have fewer street dogs per person than other areas, as shown in the table below.

	Economically Disadvantaged	Muslim	Neither
Number street dogs /100 persons	6.5	3.9	5.5

Presence of mange or other skin conditions, venereal tumors, lactating females, and puppies was determined during the course of mark-recapture counts, along with a simple assessment of general body condition. These assessments were made by experienced HSI veterinarians who conducted the mark-recapture counts. Comparable information was not collected during simple dog counts, because it was felt that non-professional volunteers might not assess these attributes in a consistent way. Frequency of mange or other skin conditions was low (1.8 %), as was frequency of venereal tumors (0.2 %) and poor body condition (1.3 %). Puppies (estimated age < 6 months) comprised 4.5 % of observed dogs, although the actual frequency of puppies was probably higher since young puppies (< 6 weeks of age) do not stray as widely as juveniles and adults and are therefore less likely to be observed by surveyors. Frequency of lactating females was 5.9 %, adding some support to the premise that the actual frequency of puppies in the street

dog population is higher than the observed frequency. The relatively low frequency of poor body condition suggests that most street dogs in Mauritius receive some level of direct or indirect care and/or supplementation from humans, and further that the frequency of fully stray dogs and true feral dogs within the surveyed areas is relatively low.

Other Findings from DD Surveys

Overall, the dog ownership rate in Mauritius was 19%, or 19 dogs per 100 human residents, and over half of the surveyed households (56%) claimed ownership of one or more dogs. Because the average number of residents per household was 4.74, this equates to an average of just under one owned dog per household. This is a relatively high rate of dog ownership compared to many other HSI program areas. The percentage of households claiming ownership of one or more dogs tends to decline with increasing human density (Figure 3), a pattern reminiscent of that illustrated above in Figure 2.
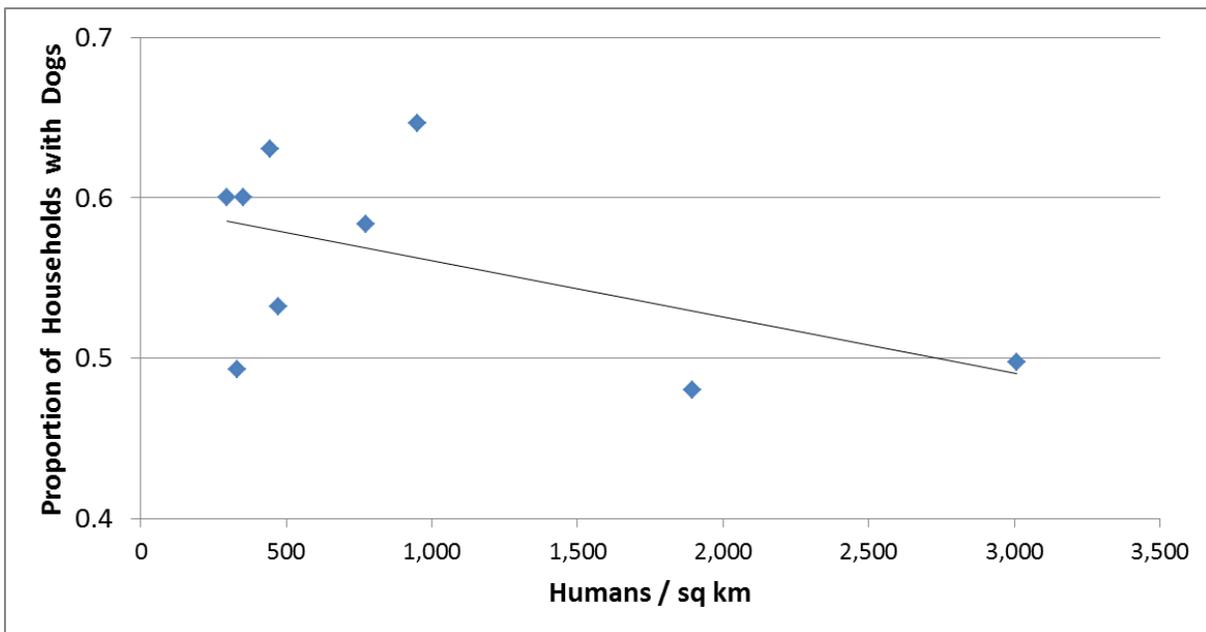
Figure 3. Household dog ownership rate as a function of human population density at the District level.

Characteristics of the owned dog population of Mauritius are summarized in Figure 4. A modest male sex bias (58%) was observed among owned dogs. As previously mentioned, just over 20% of owned dogs were reported as being free to roam. Sterilization rate was just over 30%, and slightly higher for females than for males. Vaccination rate was over 50%, but registration rate was lower at 35%.

Figure 4. Characteristics of the owned dog population of Mauritius, based on DD survey results and shown as proportions of the total population. From left to right, these include: 1) sex ratio, 2) age (adult vs. juvenile < 6 mo. of age, 3) free-roaming vs. confinement status, 4) sterilization rate for males, 5) sterilization rate for females, 6) vaccination rate, 7) registration rate, and 8) frequency of utilization of veterinary care by dog owners.
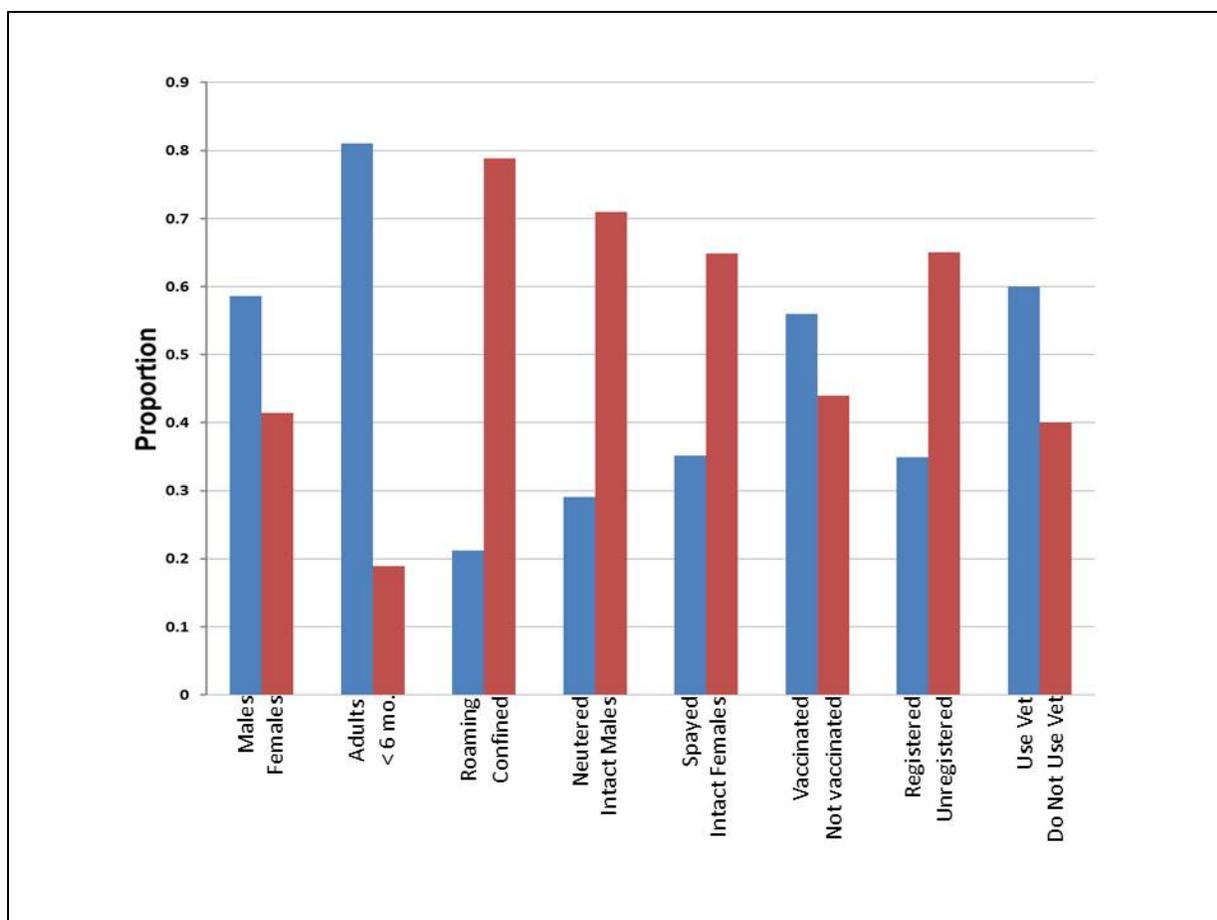
Respondents that did not sterilize, vaccinate, register, or seek veterinary care for their dogs were asked to give reasons for not doing so. Possible reasons included 1) expense, 2) inconvenience, 3) a belief that it was not necessary to sterilize / vaccinate / register, and 4) other / no reason. Respondents could choose more than one reason. A summary of these responses is shown in Figure 5. Although expense and inconvenience contributed to the failure of dog owners to sterilize and vaccinate their dogs, the most cited reason, by a significant margin, was the perception that sterilization and vaccination were "not needed". Taken in combination with the relatively large proportion of respondents who could give no reason for their inaction, this suggests that public education will be a critical component of a long-term dog management program. It is not possible with this data set to determine the degree to which "expense" and "inconvenience" might increase in relevance if greater public awareness of the importance of spaying and neutering is ultimately achieved, but it seems a likely outcome. In contrast, expense was a more significant factor in decisions about seeking routine or emergency veterinary care.
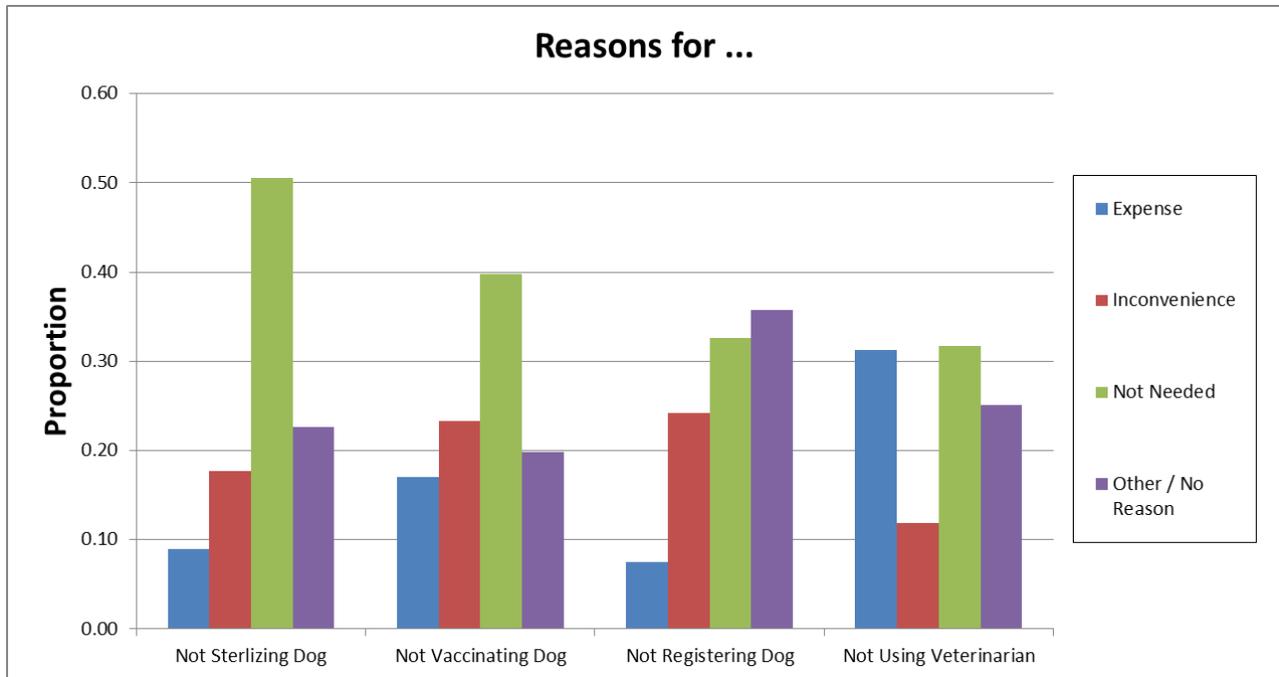
Figure 5. Reasons given for not sterilizing, vaccinating, registering, or seeking veterinary care for owned dogs, shown as proportions.

Additional questions about household animal welfare practices and attitudes were presented in the DD questionnaire. These questions and the results are summarized in the table below. Mauritians expressed a slight preference for male dogs, which corresponds closely to the observed proportion male dogs in the owned dog population. Around 30% of surveyed households are engaged in feeding street dogs for which they do not claim ownership, and a similar percentage of households have at least one family member who has been bitten or felt threatened by a dog. Large majorities feel that there are "too many street dogs", and are supportive of "humane street dog programs", although the specific type(s) of street dog program(s) that they would support were not discussed in systematic detail. The proportion of Mauritians who feel that there are too many street dogs corresponds relatively well with the percentage of dog owners who do not allow their owned dogs unrestricted access to the outdoors.

Question	Percent Responding "Yes"
"Do you prefer male dogs?"	55%
"Do you ever feed dogs that you do not own?"	37%
"Are there too many free-roaming dogs in Mauritius?"	71%
"Has anyone in your household ever been bitten or threatened by a dog?"	32%
"Do you support efforts to humanely manage street dogs?"	81%

Those respondents who felt that there were too many street dogs in Mauritius were asked to list their primary concerns about the presence of street dogs, which could include: 1) aggression, 2) unrestricted breeding, 3) noise, 4) sanitation, 5) traffic dangers, and 6) other / don't know. Respondents could choose as many answers as applied. Results are shown in Figure 6. Noise and sanitation were the most often cited concerns, and were each listed by approximately 60% of respondents.
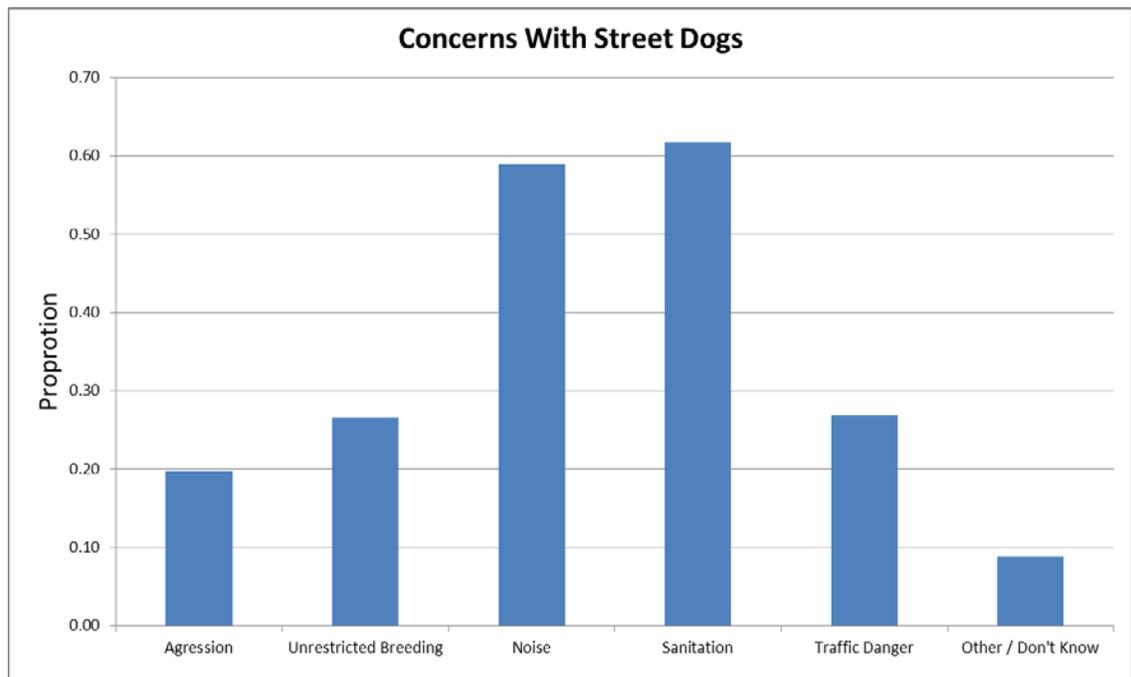
Figure 6. Proportion of respondents citing various reasons for feeling that there are too many street dogs in Mauritius. Because respondents could select more than one response, sum of proportions is > 1.

Finally, respondents were asked what they have done or would do if and when their dog has puppies. Possible answers included: 1) find a home for them, 2) keep them, 3) bring them to a shelter, 4) let them find their own home, 5) sell them, or 6) other / don't know. Respondents could choose only the single most likely answer. Results are show in Figure 7. About 70% of respondents indicated that they would find a home for the puppies or bring them to a shelter, but a large minority (30%) indicated that they would let the puppies wander to find their own home, a significant animal welfare concern and an educational challenge for achieving effective humane population control, especially given the high proportion of Mauritians who do not currently view sterilization as a priority.

Figure 7. Disposition of puppies, shown as proportions.

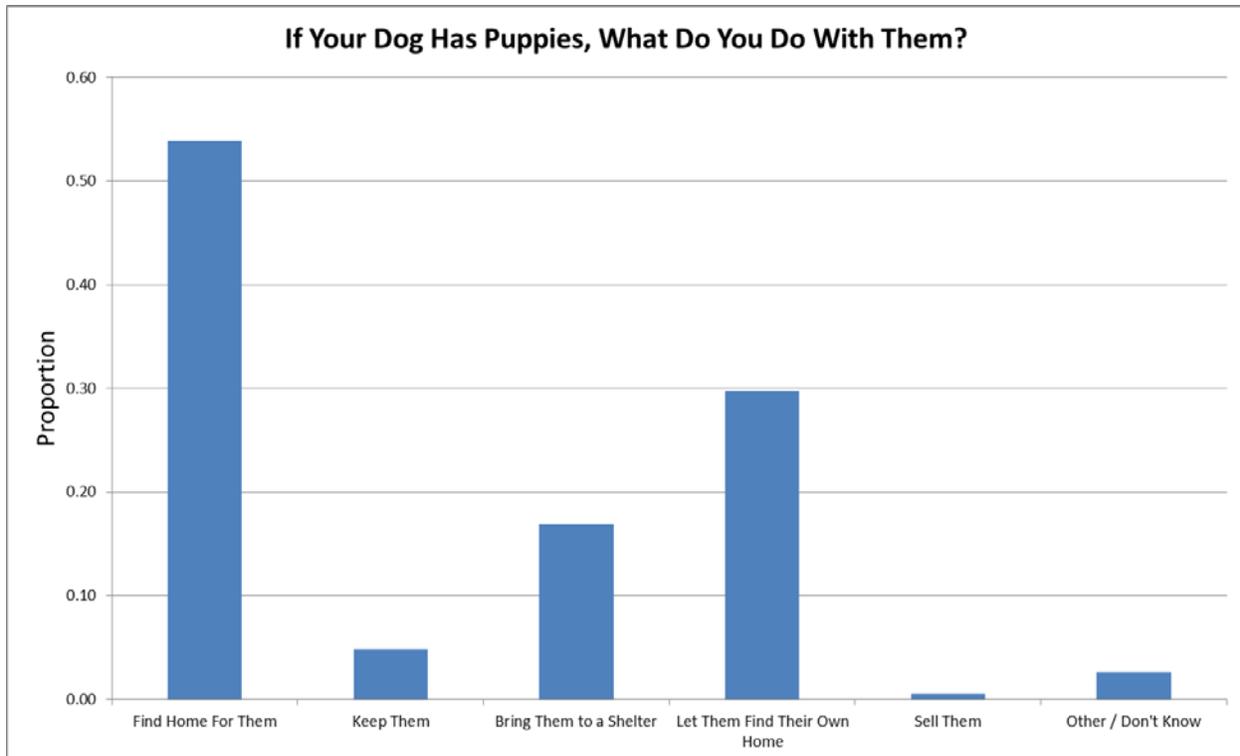The DD survey results presented in this section were fairly consistent across different municipality sizes and different municipality characteristics, and the variation that did exist was generally within a range of 15 percentage points. Therefore the findings shown in this section can reasonably be regarded as characteristic of Mauritius as a whole.

Although the 2011 Ministry of Tourism and Leisure (MOTL) survey that was mentioned previously had a different focus and smaller sample size than the DD surveys that are described in this report, there were several areas of overlap between the two efforts, and some basic comparison of results can be made. In many respects, findings between the two surveys were roughly comparable, but some areas of divergence are as follows:

1) The MOTL survey suggests that 93% of owned dogs are confined on the owner's premises, whereas the HSI survey indicates that only about 78% are confined. It is possible, and perhaps likely, that the true proportion of owned dogs allowed to roam is higher than reported in either survey.

2) The MOTL survey reports that 90% of dog owners use the services of a veterinarian at least occasionally, whereas the HSI survey indicates a lower rate of veterinary use, at 60%.

3) The MOTL survey found that only 3% of puppy owners left their puppies to stray and find their own homes, whereas the HSI survey found this behavior to be much more common (30% of puppy owners).

Without knowing the details of the MOTL survey sampling plan and methodology, explanations of these differences are necessarily speculative, but given that the MOTL survey was conducted with direct Ministry involvement, it is possible that respondents felt the need to claim "responsible" behaviors. HSI surveyors were directed to stress to respondents that their participation was entirely anonymous and that no household-specific identifiers would be collected.

RECOMMENDATIONS AND FUTURE WORK

Much of the value of a baseline survey is realized only as follow-up monitoring is systematically conducted over the ensuing years, as the management program activities are conducted. Fortunately, monitoring surveys are generally simpler and less time-consuming than an original baseline survey. This is because monitoring surveys can be conducted using fewer plots, and because it is generally sufficient to perform only simple dog counts for monitoring purposes. Trends in dog population size are best and most efficiently assessed by comparing the simple dog counts along a set of fixed survey routes (as originally established during the baseline survey) over time, rather than by generating a series of sequential population size estimates. For this reason, survey routes used during the baseline surveys have been digitally recorded and provided to HSI in electronic map formats so that they can be replicated in the future. It is strongly recommended that a formal monitoring plan be created and established prior to conducting significant dog sterilization activities or other significant programmatic activities that could have an impact on street dogs. This will ensure that the logistical needs of the monitoring plan are factored into ongoing planning, and that the monitoring surveys are scheduled proactively rather than occurring as an afterthought.

It is further recommended that all options for marking sterilized dogs be explored. Currently, there is no ideal method of marking, but even sub-optimal options provide a mechanism to generate extremely valuable data and to facilitate analytical insight. Most notably, systematically marking sterilized animals makes it possible to empirically determine the sterilization rates that have been achieved at various points in time. Currently feasible marking options include collaring, ear notching, tattooing, and freeze-branding. Program managers and local Mauritian partners should discuss these options and determine a workable approach prior to conducting significant dog sterilization activities, and then strive to ensure that the preferred marking option is uniformly implemented.

Future work that could be relevant to the subject matter of this report may be incorporated into either a revision of this report, into a revision of the Technical Supplement, or into subsequent program monitoring reports. This could include the following:

1) Acquisition of Mauritius Census data to explore how the characteristics of the human population (including economic status, educational status, housing type, etc.) influence patterns of street dog distribution and density. This analysis can be conducted at various levels of resolution (District level, municipality / ward level, census tract level, etc.).
2) Use of specialized statistical methods to calculate an estimate of accuracy (i.e. confidence interval) for the population size estimates.
3) Analysis of program progress using monitoring survey data.

Appendix 1. List of the municipalities that were represented within the 44 plots that received dog surveys and the 42 plots that received door-to-door surveys, showing their districts, characteristics, and the survey types that were used. Some of the smaller municipalities were combined within a single plot and therefore share the same plot number, so these plot numbers occur on more than one line in the table below. For "Survey Type", "Simple" = simple dog count, "M-R" = mark-recapture count, and "DD" = door-to-door survey. For "Size", "Small" indicates municipalities with fewer than 5,000 people, "Medium" municipalities with 5,000 – 12,000 people, and "Large" municipalities with more than 12,000 people.

Plot Number	District	Municipality	Survey Type	Location	Size
5	Grand Port	Rose Belle	M-R, DD	Inland	Large
7	Grand Port	Nouvelle France	Simple, DD	Inland	Medium
8	Grand Port	Bananes	Simple, DD	Inland	Small
8	Grand Port	Cluny	Simple, DD	Inland	Small
12	Grand Port	Plaine Magnien	M-R, DD	Coastal	Medium
13	Grand Port	Mahebourg	Simple, DD	Coastal	Large
15	Grand Port	Grand Bel Air	DD	Coastal	Small
15	Grand Port	Petit Bel Air	DD	Coastal	Small
15	Grand Port	Riviere des Creoles	DD	Coastal	Small
16	Grand Port	Bambous Virieux	M-R, DD	Coastal	Small
16	Grand Port	Bois des Amourettes	M-R, DD	Coastal	Small
21	Grand Port	Mare d'Albert	Simple, DD	Inland	Small
29	Savanne	Grand Bois	Simple, DD	Inland	Medium
32	Savanne	Chemin Grenier	M-R, DD	Inland	Large
35	Savanne	Surinam	Simple, DD	Coastal	Medium
38	Savanne	Saint Aubin	M-R, DD	Inland	Small
39	Savanne	Tyack	Simple, DD	Inland	Small
42	Savanne	Bel Ombre	Simple, DD	Coastal	Small
43	Savanne	Blaie du Cap	M-R, DD	Coastal	Small
44	Pamplemousses	Villebague	Simple, DD	Inland	Small
44	Flacq	Brisee Verdiere	Simple, DD	Inland	Medium
45	Riviere du Rempart	Mapou	DD	Inland	Small
45	Pamplemousses	Plaines des Papayes	DD	Inland	Medium
47	Pamplemousses	Trou-aux-Biches	M-R, DD	Coastal	Small
51	Pamplemousses	Pamplemousses	M-R, DD	Inland	Medium
55	Pamplemousses	Baie-du-Tombeau	Simple	Coastal	Large
58	Pamplemousses	Terre Rouge	Simple, DD	Inland	Medium
65	Riviere du Rempart	Poudre d'Or	M-R, DD	Coastal	Small
65	Riviere du Rempart	Riviere du Rempart	M-R, DD	Inland	Medium
66	Riviere du Rempart	Amitie-Gokhoola	M-R, DD	Inland	Small
66	Riviere du Rempart	Belle Vue Maurel	M-R, DD	Inland	Small
66	Riviere du Rempart	Piton	M-R, DD	Inland	Small
68	Riviere du Rempart	Goodlands	Simple, DD	Inland	Large

Plot Number	District	Municipality	Survey Type	Location	Size
71	Riviere du Rempart	The Vale	M-R, DD	Inland	Small
71	Riviere du Rempart	Petit Raffray	M-R, DD	Inland	Medium
72	Riviere du Rempart	Grand-Baie	Simple, DD	Coastal	Medium
73	Riviere du Rempart	Grand-Baie	M-R, DD	Coastal	Medium
75	Black River	Case Noyale	Simple, DD	Coastal	Small
75	Black River	La Gaulette	Simple, DD	Coastal	Small
80	Black River	Cascavelle	Simple, DD	Inland	Small
81	Black River	Bambous	Simple, DD	Inland	Large
85	Black River	Petite Riviere	Simple, DD	Inland	Small
85	Black River	Richelieu	Simple, DD	Inland	Medium
92	Moka	Esperance	Simple, DD	Inland	Small
92	Moka	Verdun	Simple, DD	Inland	Small
99	Flacq	Bel Air Riviere Seche	Simple, DD	Inland	Large
100	Flacq	Grande Riviere South East	Simple, DD	Coastal	Small
103	Flacq	Bramsthan	Simple, DD	Inland	Small
103	Flacq	Queen Victoria	Simple	Inland	Small
103	Flacq	Ecroignard	Simple	Inland	Medium
104	Flacq	Saint Julien (Haut de Flacq)	Simple, DD	Inland	Small
129	Plaines Wilhems	Curepipe Ward 2	M-R, DD	Inland	Large
138	Port Louis	Port Louis Ward 1	Simple, DD	Coastal	Large
143	Port Louis	Port Louis Ward 2	M-R	Inland	Large
145	Port Louis	Port Louis Ward 2	Simple, DD	Inland	Large
150	Port Louis	Port Louis Ward 3	Simple, DD	Coastal	Large
152	Port Louis	Port Louis Ward 4	M-R, DD	Inland	Large
158	Port Louis	Port Louis Ward 5	DD	Inland	Large
159	Port Louis	Port Louis Ward 7	Simple	Inland	Large
168	Plaines Wilhems	Quatre Bornes Ward 2	Simple. DD	Inland	Large
181	Plaines Wilhems	Vacoa-Phoenix Ward 1	Simple	Inland	Large
193	Plaines Wilhems	Vacoas-Phoenix Ward 4	M-R, DD	Inland	Large

Appendix 2. Questionnaire used for door-to-door surveys. Full survey protocol is given in the Technical Supplement.

<u>Questionnaire</u>:

Note: Some questions will not be applicable for every house. For any question that is not applicable to a given house, you can either leave the space on the data sheet blank or enter "na".

1. How many people live in this house?
2. How many dogs and cats do you own? (N = none, enter "D" for each dog, using a new line for each individual dog, and "C" for cat, using a new line for each individual cat)
3. <u>For each animal:</u>
   a. Is it male or female? (M = male, F = female)
   b. Is it an adult (> 6 mo.) or Juvenile (< 6 mo.)? (A = Adult, J = Juvenile)
   c. Is it always confined, always free-roaming, or both? (C = Confined, F = Free-roaming, B = Both) (this question may require some explanation, to be sure people know what we mean by free-roaming and confined)
   d. Where does it sleep? (I = inside, Y = yard, O = outside somewhere)
   e. Is it sterilized? (Y = yes, N = no) (this question may require some explanation)
      i. if it is NOT sterilized, why not? (NN = no need, E = expense, I = inconvenient, NH = not healthy or bad for temperament, O = Other) (may enter more than one response)
   f. Is it vaccinated? (Y = yes, N = no)
      i. if it is not vaccinated, why not? (NN = no need, E = expense, I = inconvenient, NH = not healthy, O = Other) (may enter more than one response)
   g. Is it registered? (Y = yes, N = no)
      i. if it is not registered, why not? (E = expense, I = inconvenient, NN = no need, DK = didn't know it was required) (may enter more than one response)
4. Do you ever take any of your pets to a veterinarian? (Y = yes, N = no)
   a. if you never do, why not? (NN = no need, E = expense, I = inconvenient, OO = use other options, O = Other)
5. Do you feed any dogs or cats that you do not own? (D = dogs, C = cats, B = both, N = neither.
6. Do you prefer male or female dogs? (M = male, F = female, N = neither or no preference)
7. Are there too many dogs on the street in the area where you live? (Y = yes, N = no, DK = don't know or no opinion)
   a. if you think there are too many dogs, what issues concern you? (A = aggression, S = sanitation / messes, B = breeding, N = noise, T = impedes traffic, O = other) (you may enter more than one response)
8. Have you ever been bitten or threatened by a dog on the street? (Y = yes, N = no)

9. If your dog has puppies, what do you do with the puppies? (FH = find a home for them with friends or neighbors, S = sell them, K = keep them, L = let them find their own home, SH = take them to a shelter or to a facility, O = Other)
10. Do you support efforts by the government, PAWS, and Save Our Strays to improve the situation for dogs in Mauritius? (Y / N / DC = Don't care or no opinion)