HUMANE SOCIETY INTERNATIONAL

Owned Dog, Beach Dog and Street Dog Population Surveys

Flacq District Dog Management Programme Mauritius

2018-2021

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Executive Summary

Free-roaming dogs on the streets and beaches of Mauritius have typically been considered a nuisance and public health concern by residents, and in particular, a stain on the country's vibrant tourism sector. Following an agreement between Humane Society International (HSI) and the Mauritian Ministry of Agro-Industry in February 2018, HSI provided a canine spay and neuter service full-time between June 2018 and December 2019 in Flacq District. Collaboration with local veterinarians followed after this period at specific veterinary clinics, with HSI funded sterilisation efforts ending in January 2021. After this time, a small fee was introduced for sterilisation by local clinics.

This report analyses the effect of the HSI sterilisation programme on canine welfare, reproduction, and human-dog relationships over the course of 2018-2020 in the Flacq District of Mauritius. The analyses herein are based on data collected from dog populations and household surveys in eleven priority areas of the Flacq District during this period, and a follow up in 2021 after programme cessation to examine the permanence of the programme's effects.

Generally, while surveys indicate a marked increase in the percentage of dogs sterilised both within and outside project areas, however, this percentage decreased rapidly following cessation of the programme. Dog welfare indicators (body and skin condition) appear to have improved over the course of the programme, but similarly seems to be dropping again as sterilisation levels decline. Reproductive indicators (female lactation and pup prevalence) generally remained constant given that the programme failed to achieve sterilisation rates high enough to significantly reduce canine reproduction.

HSI's programmes did appear to have a positive and lasting effect on human-dog relationships, with household surveys in 2018 and 2021 showing an increase in positive attitudes towards roaming dog populations and a reduction in human-dog conflict.

We recommend that the Mauritian government continues to promote human-dog amicability and utilises the apparent improvements in attitudes to encourage sterilisation of owned dogs. For longer-term population control and welfare improvements of the roaming dog populations however, we believe that an additional longer-term sterilisation effort will be required.

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Free roaming dogs on the public beach

Background

The Flacq district is located in the east of Mauritius, comprising both coastal and inland areas (Fig. 1).

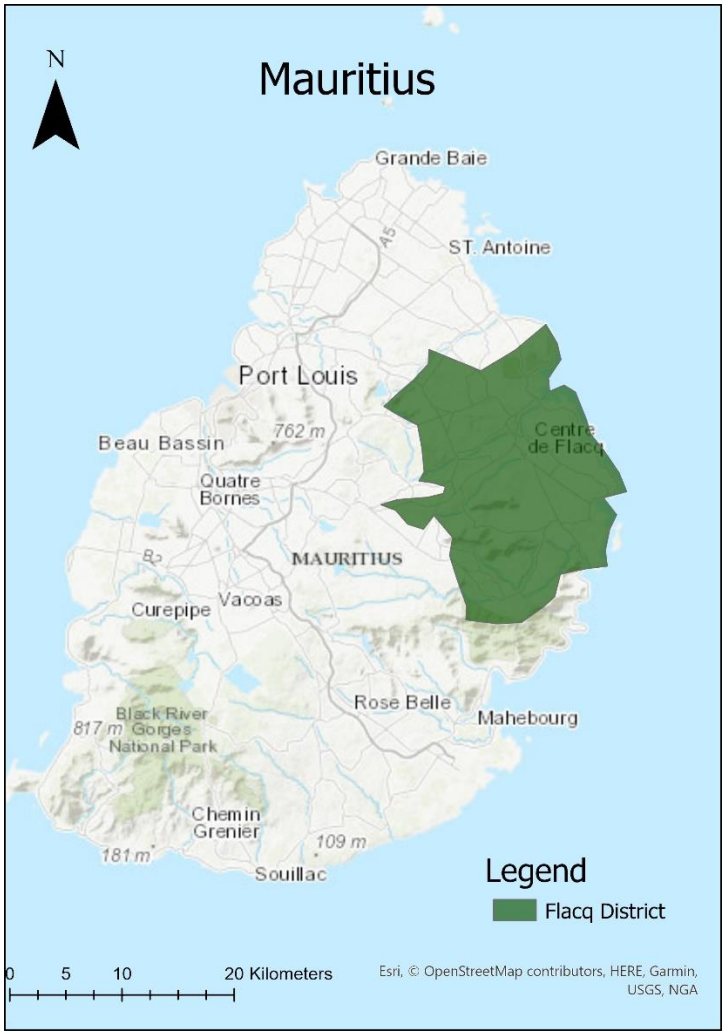


Figure 1: Geographic location of the Flacq district (Arc GIS Map)

Free-roaming dogs on the streets and beaches of Mauritius have typically been considered a nuisance and public health concern by residents, and in particular, a stain on the country's vibrant tourism sector. As such, plans to implement a sterilisation program to address management of the free roaming dog population in Mauritius have been discussed for a long time.

In 2013, a nationwide free roaming dog population survey and owned dog population survey was conducted by HSI and the Mauritian government's Ministry of Agro-Industry. Surveys were conducted to estimate the total dog population to plan an evidence-based sterilisation intervention. In February 2018, HSI and the Ministry of Agro-Industry signed a landmark MoU to implement a sterilisation program targeting 10,000 owned dogs in a pilot area of the Flacq district, with the aim to manage population density and reduce human-dog conflict. In preparation of the sterilisation and responsible dog ownership intervention in the pilot area, several baseline surveys were carried out in March 2018.

Following baseline surveys, spay and neuter services through HSI were available from June 2018 to December 2019 through a government-provided clinic as well as through a mobile clinic. These clinics offered free of cost spay/neuter services to owned dogs brought by the pet owners from the Flacq District area as well as adjoining areas. A team of animal welfare officers also actively caught free-roaming dogs from the public beach and tourist attractions for spay/neuter and returned them to the caught location upon fit to retuned. After December 2019, HSI led specific spay/neuter days at various animal clinics, with the collaboration of local veterinarians and animal welfare groups. Beginning in February 2021, a small fee for sterilisation was implemented for those bringing in animals, whether they be owned or roaming.

Follow up surveys conducted biannually in 2018 and 2019 during the time period of sterilisation programme operation. HSI funded sterilisation efforts ended in January 2021, however there was continued involvement of local clinics after this date. A final street count-beach count surveys were conducted in September 2021 and a Knowledge, Attitude and Practice (KAP) survey in December 2021 in order to assess the lasting effects of the sterilisation programme after its discontinuation.

Throughout the programme duration, a total of 5,341 dogs were sterilised. In 2018 and 2019 the programme sterilised 2078 and 2371 dogs respectively; during these two years, the programme operated full time for seven months a year. From 2018 to 2019 there was a decrease in the number of dogs with apparent skin conditions. The following two years saw a decrease in sterilisations (435 and 507, respectively); during these two years, the programme was running at half capacity due to the COVID-19 pandemic.

Throughout the programme, community engagement and education efforts were made, including education on the importance of spaying and neutering, and an exchange program where owners could replace metal chains for their dogs with safe, comfortable collars. Through these efforts, the HSI team interacted with 9,512 community members.

Survey Design and Methodology

HSI conducted four types of survey in the Flacq district between 2018 and 2021: a dog demographic and KAP (Knowledge, Attitude, and Practices) survey, a street dog survey, a beach dog survey and a beach visitor survey. The beach visitor survey was not conducted after 2018 and is not dealt with in this report (see 2018 report for findings).

Street and beach dog surveys were conducted biannually between March 2018 and September 2019, with a follow-up survey conducted in September 2021. Dog demographic and KAP surveys were conducted in 2018 and 2021, indicating the effect that HSI's programme had on attitudes towards dogs.

Street Dog Survey

Street dog surveys focus on the street dog population, which likely represents proportions of roaming private and truly unowned dogs of unknown ratio. Street counts provide relative estimates of the roaming dog population and further provide a quantitative assessment of how many dogs are encountered daily by residents.

Street dog survey objectives:

- Estimate street dog density in the Flacq district
- Estimate the proportion of sterilised dogs within the street dog population
- Estimate the effect of sterilisation efforts on reproductive dynamics of the street dog population
- Assess street dog welfare by tracking two indicators—body condition score and skin conditions—as a proxy measure
- Estimate change in these variables over time through comparison of longitudinal surveys

We plotted index routes in Google Maps along residential roads and highways but avoiding expressways (dogs tend to avoid these roads). Routes were marked with a starting (flag) and end point (police officer) (Figure 2). For easy access, the routes were saved as KML files and stored in Google My Places, which can be accessed from smartphones (online and offline). A survey team, consisting of a driver and an observer mounted on motorcycles, conducted the surveys early in the morning. The observer uses both the Google Maps app and the OSM Tracker app on a mobile phone. OSM tracker is an application that enables the observer to record a dog sighting and relevant specifics about a dog (female, male or unknown adult, sterile/notched female or sterile/notched male, pup, lactating) as well as record welfare indicators such as skin problems and body condition scores (BCS1 to BCS5), which are saved together with GPS coordinates of the sighted dog. OSM Tracker produces a track record of all sighted dogs and their specifics along the route which was followed during the survey. The data is subsequently downloaded and stored in an Access database for analysis. The survey route was surveyed on two consecutive days, by the same survey team, to increase reliability and measure accuracy.

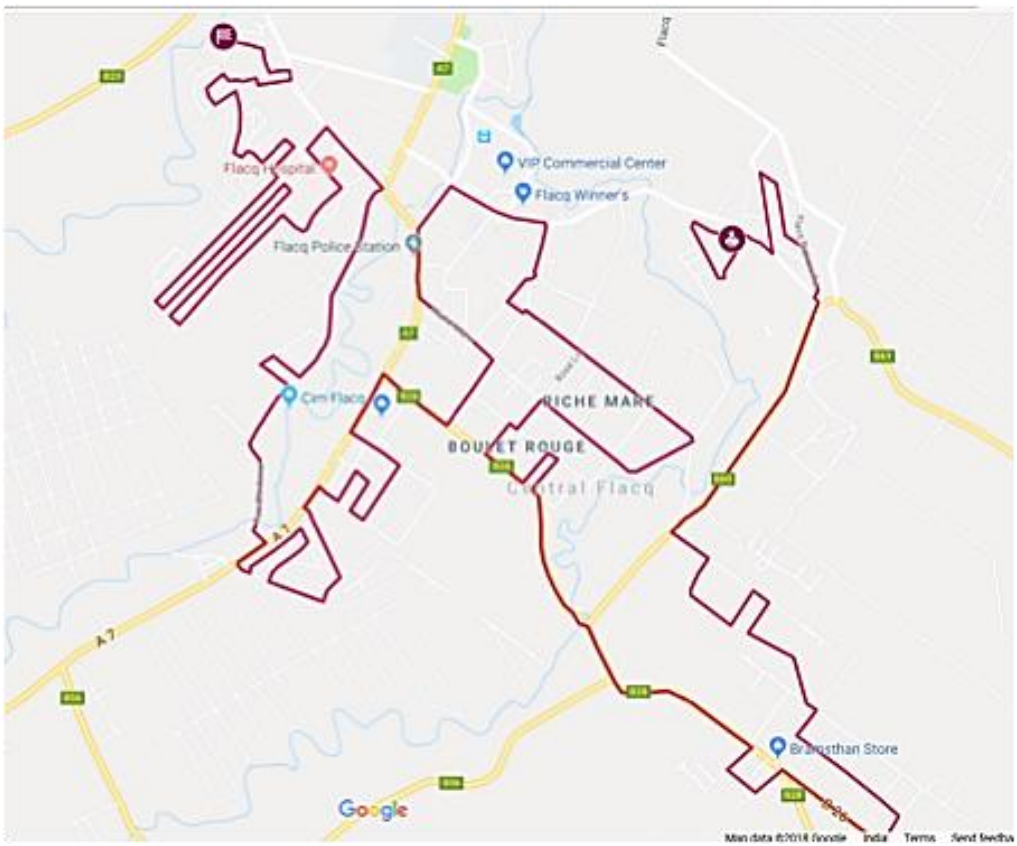


Figure 2: Survey track through central Flacq (control area)

Beach Dog Survey

Beach dog counts have never been conducted in Mauritius and were developed by the authors to estimate and explore the beach dog population on public beaches. This baseline assessment provides both an estimate of dog densities on public beaches as well as their composition.

Beach dog survey objectives:

- Estimate beach dog density in the Flacq District
- Estimate the proportion of sterilised dogs within the beach dog population
- Assess beach dog welfare by tracking two indicators—body condition score and skin conditions—as a proxy measure
- Estimate change in these variables over time through comparison of longitudinal surveys

Beach dogs are a main concern in terms of human-dog conflict and have been used in the past as an example of how roaming dogs hurt the tourism industry and disturb residents. Beach dogs and people who frequently use public beaches for recreational activities are a focus of all three HSI program departments, MEIA, Clinics and Community Engagement. To evaluate the impact of the program and explore beach dog ecology the two largest public beaches in the pilot area, Belle Mare Beach, and Palmar Beach, were selected as the baseline and monitoring beaches (Figure 3).

Two protocols were used depending on the width of the beach, but both using transects to narrowly survey the beach area, as vegetation and width vary along the beaches significantly. For example, one end of Belle Mare Beach is wide which required the first survey protocol and another section of the beach is narrow and required the second protocol. Surveys were conducted in the morning between 7:00 and 10:00.

Figure 3: Geographic location of the beach survey locations (marked in black circles) . The northern Bras D' Eou public beach was not used after initial pilot surveys, and is not included in this report

Protocol 1 (Figure 4)

Surveys were conducted along transects. The survey started at one end of the public beach area (indicated by a flag). The survey team comprised of three surveyors. One person was assigned to be the recording observer who had to remain on a straight line and recorded the dogs encountered in the OSM tracker app. The other two observers walked to the left and right of the recording observer reporting the number and composition of dogs they saw. From the starting point, the surveyors walked a straight line to the beach, walked along the beach for about 40m/60-80 steps before turning towards the main road again (90 degrees turn). From there they walked straight to the parking area or street. Turned and walked 40m/80 steps along the road or fence of the parking lot and turned towards the beach again to walk straight towards it. This was repeated until the end of the survey area was reached, indicated by a line or police-officer icon. Surveyors needed to be cautious not to count the same dog twice. To account for this, dogs that were coming towards the surveyors were recorded and dogs walking away from the surveyor were not because the chances were high that these dogs would be encountered again.

Figure 4: Survey following Protocol 1 – Pink zig-zag line for walking route

Protocol 2

Entire or parts of beaches that are smaller were surveyed along the beach instead of the intense transect method in Protocol 1. These areas were instead intensely covered by distributing the observers in parallel lines covering the whole width of the beach, when A, the beach can easily be observed by three surveyors walking parallel along the beach, and B, there are no forested areas which would make communication between the surveyors impossible. The same observer and recorder arrangement were employed as in Protocol 1.

Private Dog Demographics and KAP Survey

KAP surveys explore perspectives of the human population with regards to the human-dog relationship on the beaches and the relationship residents of the villages in the Flacq district have with their own, other private and street dogs. Dog demographic questions were included in the survey to explore private dog demographics and reproductive success of private dogs and the frequency of dog bites.

Household survey (KAP) objectives:

- Generate a reliable estimate of the private dog population
- To understand private dog demographics and population dynamics
- Estimate sterilization and vaccination rates among privately owned dogs
- Assess the level of responsible dog ownership
- Explore attitudes pertaining to the relationship between households and street dogs
- Asses to what degree beach dogs are perceived as a disturbance/nuisance

Common narratives around the street dog issue in Mauritius are linked to roaming, unhealthy and beach dogs being a nuisance or concern to tourists and locals. To explore knowledge, attitude, and practices regarding owned, street and beach dogs we created a household questionnaire, which provides insights into these issues. The survey was conducted using the smartphone app Epicollect5, which contained a prepared survey form for the pilot area in Flacq. Households were surveyed by a team of two trained surveyors using questionnaires about 15-25 mins in length. Questionnaires included or excluded questions depending on whether the household owned a dog or not.

Inclusion criteria for households were:

- The person being interviewed had to be over 18 years old and a resident at the address
- In the case of dog ownership, the interviewee had to be the main caretaker or at least well informed about the dog or dogs in the household

Participants were asked to confirm their consent to be part of the study and had the option to opt-out before the interview started. Once questionnaires were completed, the completed forms were saved and uploaded to a cloud-based database by the surveyor.

Household surveys were conducted with a systematic random sampling method, which samples a portion of the total available households in the area. Starting at one end of the council area map, surveyors interviewed every third household (Figure 5).

To remain consistent throughout the survey either the left or the right side of the street was surveyed. In case nobody was available at the third household, the second or the fourth household was interviewed instead.

Figure 5: Example of the tracked movement of the survey team in Google My Maps during household surveys in Olivia – Blue line indicates walking track

Results

Street and Beach Dog Surveys

Street and beach dog surveys were carried out across nine regions of the Flacq District, of which six were within bounds of the HSI project area and three were not. Of particular interest is the effect of sterilisation programme efforts in the project area on the dog population both within and outside the project area, as well as on the public beaches surveyed. The results of the surveys concerning reproductive (lactation and pup proportions) and welfare (proportion of skin conditions and emaciation) indicators in both project and non-project areas are shown below, between March 2018 (pre-programme), March 2018 – September 2019 (during the programme), and September 2021 (6-9 months after the end the programme).

Flacq District

In Flacq District, the surveyed proportions of street dogs sterilised rose from 0 to 40% over the first two years of the sterilisation programme, with non-project areas exhibiting almost as significant a rise as in project areas (albeit with an initial temporal lag)—evidence for the wider ranging efficacy of localised sterilisation programmes within a wider population. This

sterilisation proportion drops rapidly after cessation of the programme, down to 25% and 10% in project and non-project areas respectively. This indicates that a higher proportion of sterilisation (at least in females) must be achieved in order to have long-lasting impacts on the population.

Reproductive dynamics—female lactation and pup proportions—exhibit a clear annual seasonality and appear to be little influenced by increased sterilisation proportions. This fits with observations of other programs globally, where a threshold sterilisation proportion of at least 60% appears necessary to initiate reproductive decline, again supporting the need for higher rates of sterilisation in the region. See Figure 6. Despite the lack of apparent impact on reproductive indicators however, when total dog abundance (survey count) is examined, there does appear to have been some degree of population reduction with increasing sterilisation in both project and non-project areas, rising again as expected when sterilisation rates fall (Fig. 7). The fact that such dynamics are observed even in non-project areas indicates just how mobile and integrated the roaming dog populations of the district must be: intervention or other change in one area affects the population across the district as a whole.

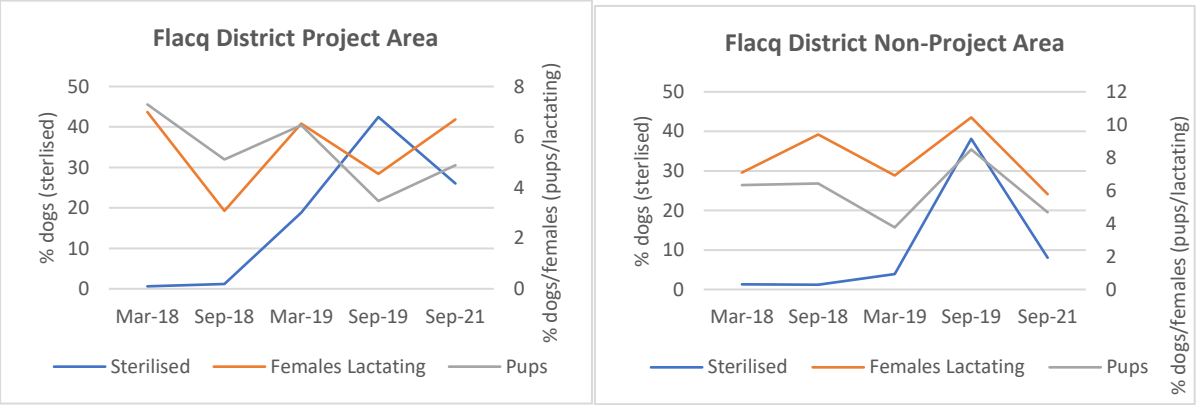


Figure 6: Change in proportion of sterilisation and reproductive indicators over time in Flacq District

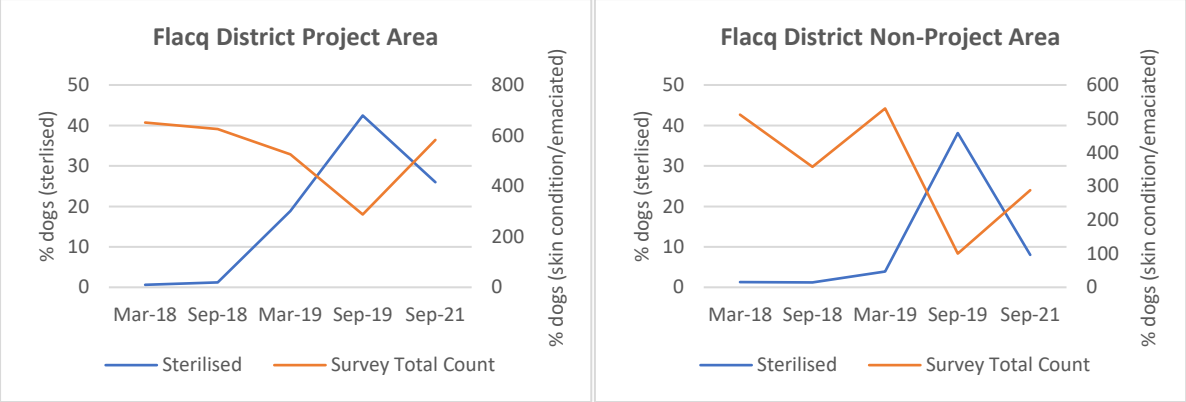


Figure 7: Change in proportion of sterilisation and total dog abundance over time in Flacq District

The effect of sterilisation on skin conditions and emaciation appears to have been significant, with prevalence dropping to less than half within the first year of sterilisation. It is notable

however that both conditions now appear to be rising as sterilisation proportions fall. See Figure 8.

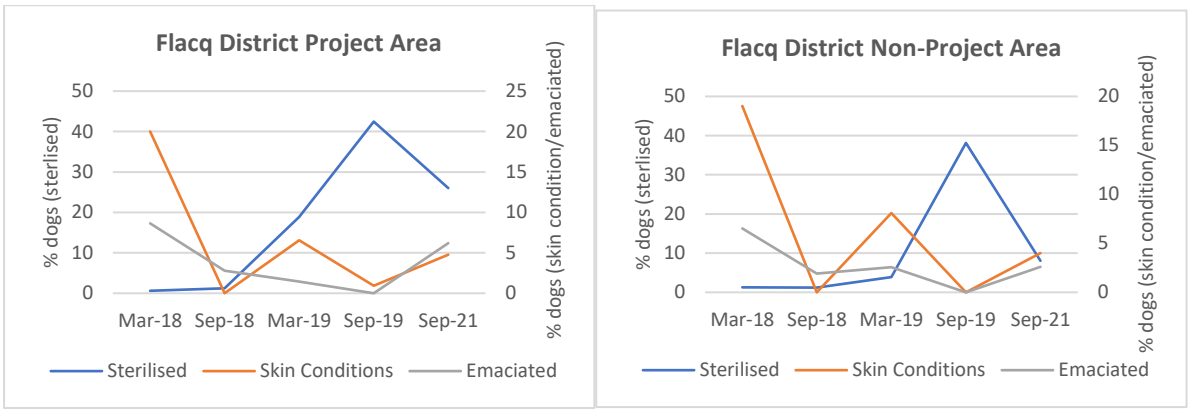


Figure 8: Change in proportion of sterilisation and welfare indicators over time in Flacq District

Public Beaches

The public beach surveys show even more significant increases in sterilisation proportions, from 0 to over 80% within the course of the program. This may potentially be due to a lower rate of population replacement (via interbreeding and migration between neighbouring dog populations) within beach dog populations. Interestingly, after cessation of the program, only the proportions on Bell Mare dropped, while those of Palmar remained high—this may however be a misrepresentation due to extremely small sample sizes. Total dog abundance shows similar dynamics. See Figures 9 and 10

As might be expected with such high sterilisation rates, reproductive indicators fell dramatically, and now begin to rise where sterilisation proportions drop. The data on skin conditions and emaciation is less clear (Figure 11), although once again the sample sizes of both surveys may be considered too small to give an accurate representation of population dynamics.

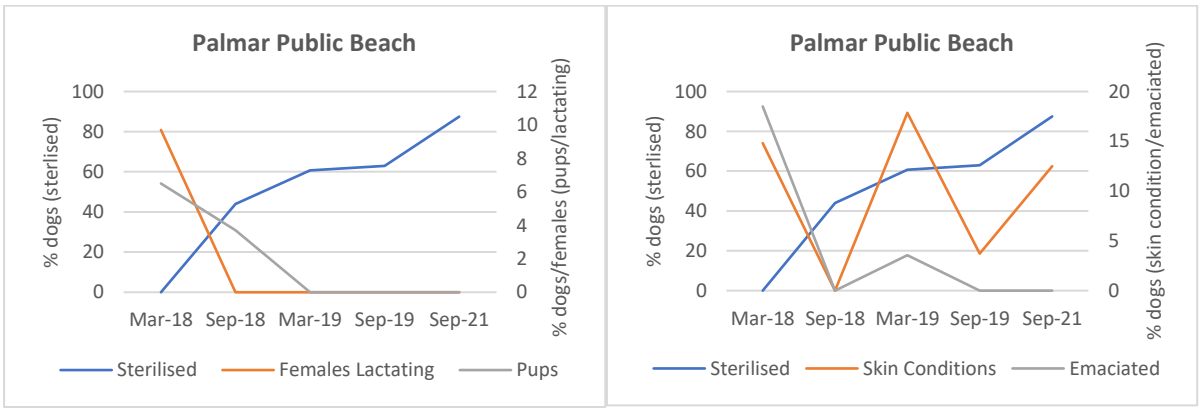


Figure 9: Change in proportion of sterilisation and reproductive indicators over time in beach populations

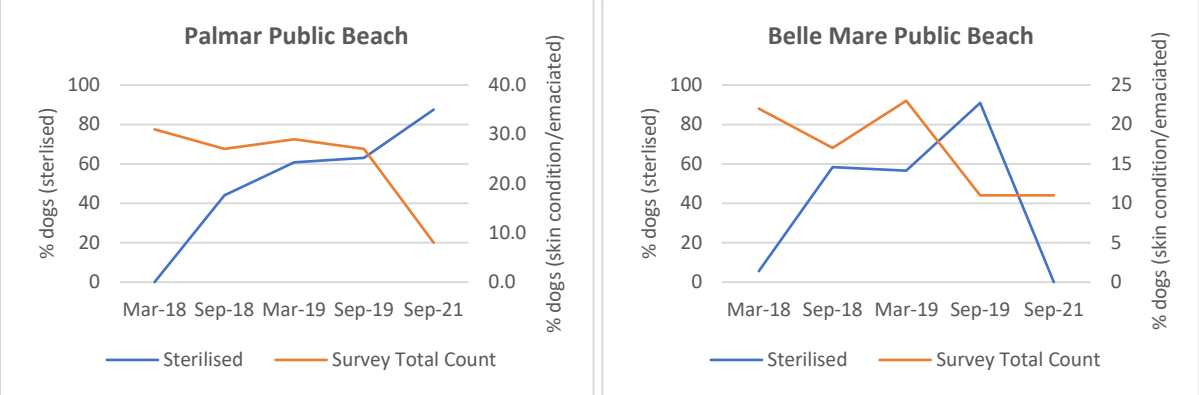


Figure 10: Change in proportion of sterilisation and total dog abundance over time in beach populations

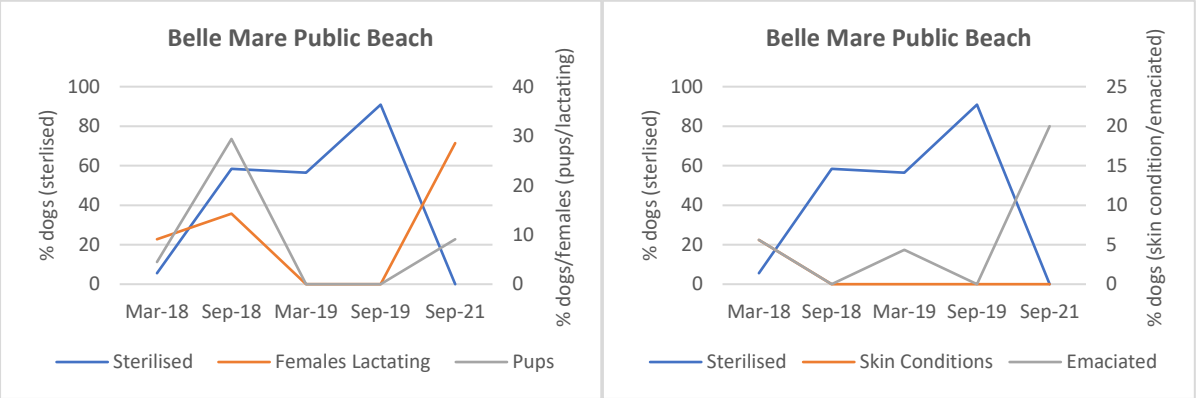


Figure 11: Change in proportion of sterilisation and welfare indicators over time in beach populations

Private Dog Demographics and KAP Survey

Household surveys were conducted in both 2018 and 2021 to examine the effect of HSI presence on local knowledge, attitudes and practices concerning the street dog population. There were 1269 respondents in 2018 and 457 in 2021. It is notable that while a similar number of households were surveyed from each region in 2021 (range: 44-48), in 2018 samples ranged from 40 to 350 between regions. As such, the possibility of region-linked biases in the 2018 survey should be acknowledged. This report is especially interested in the change of responses between 2018 and 2021, which may presumably be attributed to the impact of HSI's sterilisation programme in the region.

Note that the 2018 and 2021 surveys were not identical in questions asked—only those questions that match up were analysed.

Ownership

In 2018, 682 of 1268 respondents (53.8%) reported to own at least one dog. In 2021, the proportion was significantly higher: 301 of 456 (66.0%); X-squared = 5.2001, df = 1, p-value =

0.02259. The distribution of how many dogs were owned by each owner was very similar between the two years. The reasons given for owning dogs were also similar between the surveys, with a slight shift towards pet/companionship rather than solely protective motivations in 2021, with the highest response rate shifting from the latter to the former. This perhaps demonstrates an increased affection toward dogs over this time period, with even those owners utilising dogs for protective reasons, noting their presence as companions more so in 2021.

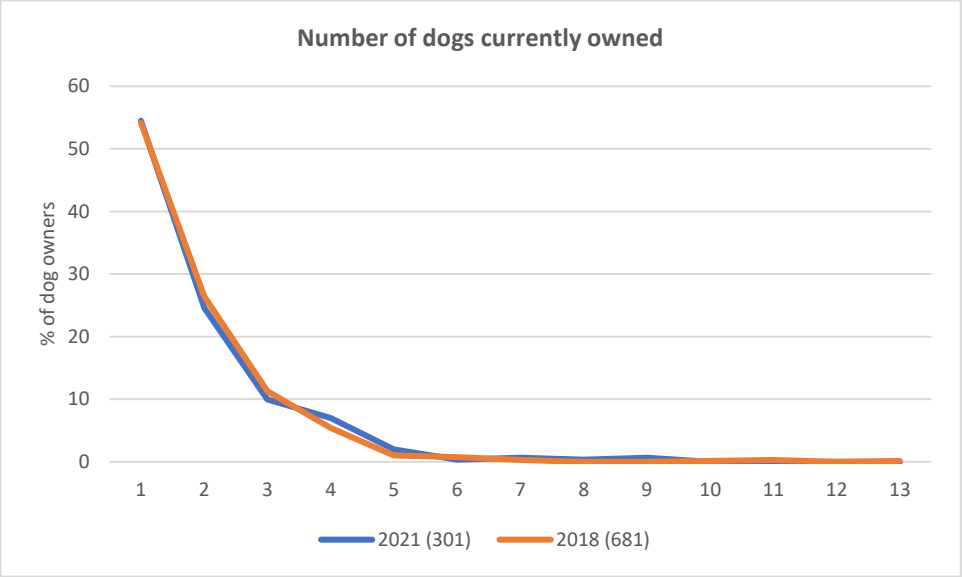


Figure 11: Proportion of dog-owning households

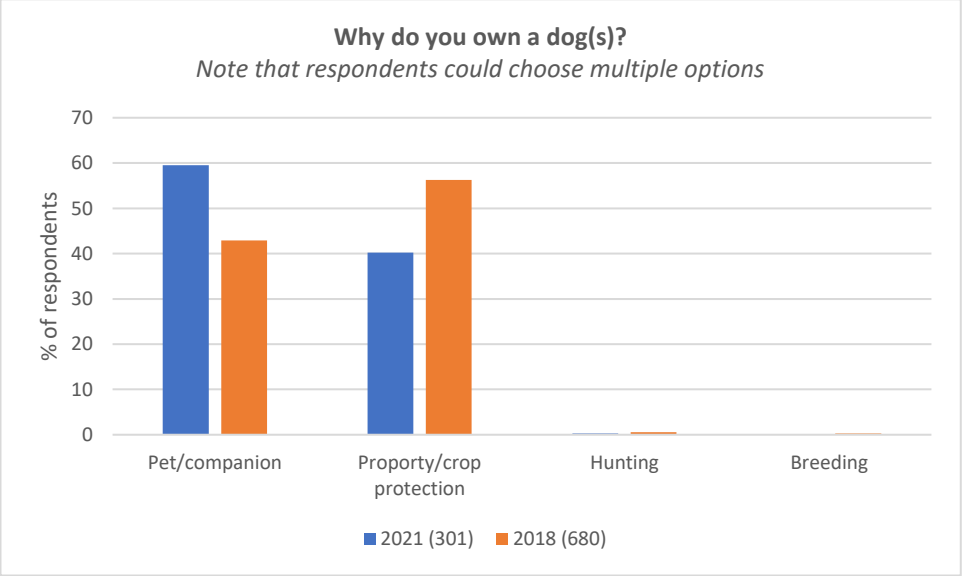
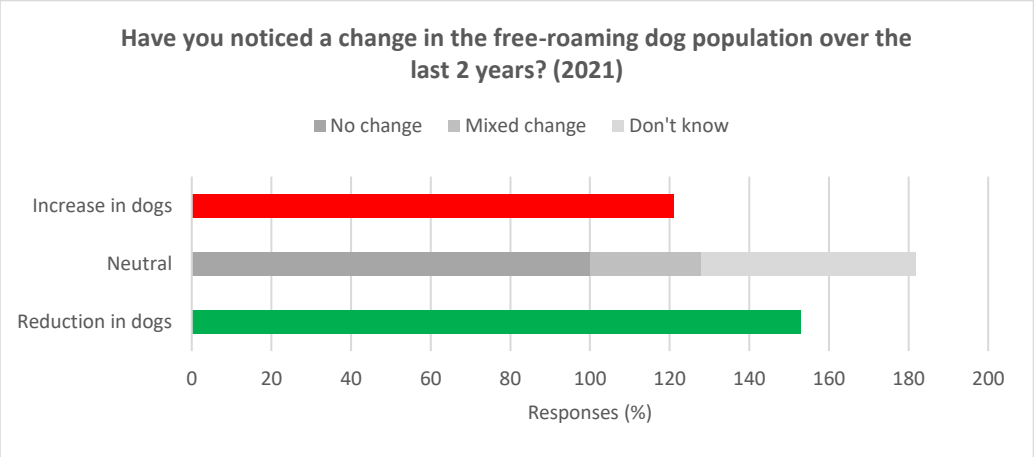


Figure 12: Reason for owning a dog

Free-roaming population and management

In 2018, 619 of 1188 respondents (excluding 79 'don't know' responses) reported unowned dogs (52.1%) in the neighbourhood. In 2021, this had risen to 294 of 446 respondents (10

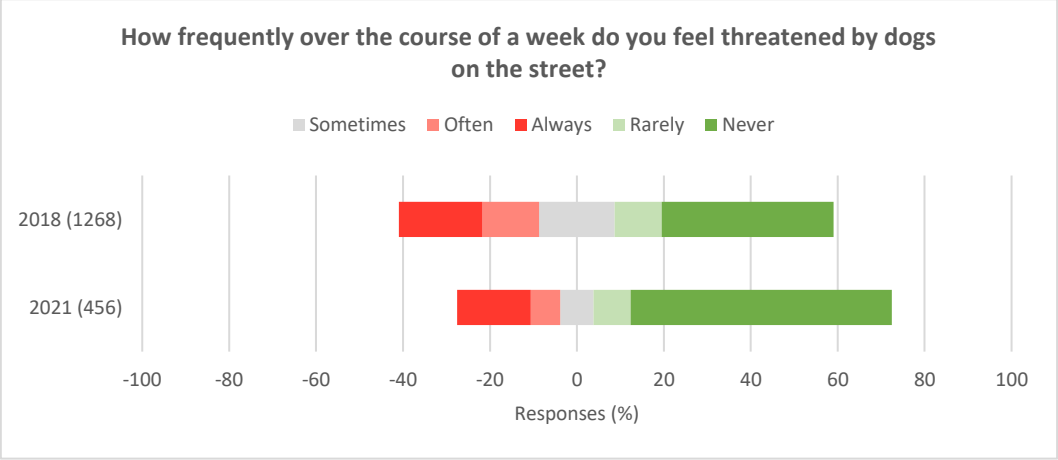
excluded; 65.9%): a significant difference: X-squared = 6.605, df = 1, p-value = 0.01017. This is not supported however by the greater number of responses (153 of 402; 38.1%; 54 'don't know' responses excluded) that report a decrease in the free-roaming population, compared to those that report an increase or give neutral responses. It may be that shifts in the unowned versus owned composition of the free-roaming population are a factor in this inconsistency.



In 2018, 105 of 1268 respondents had heard of the HSI project (8.3%). In 2021, this had risen to 200 of 456 respondents (43.9%). This may simply be considered an inevitable consequence of the HSI's presence in the area over the intervening time period.

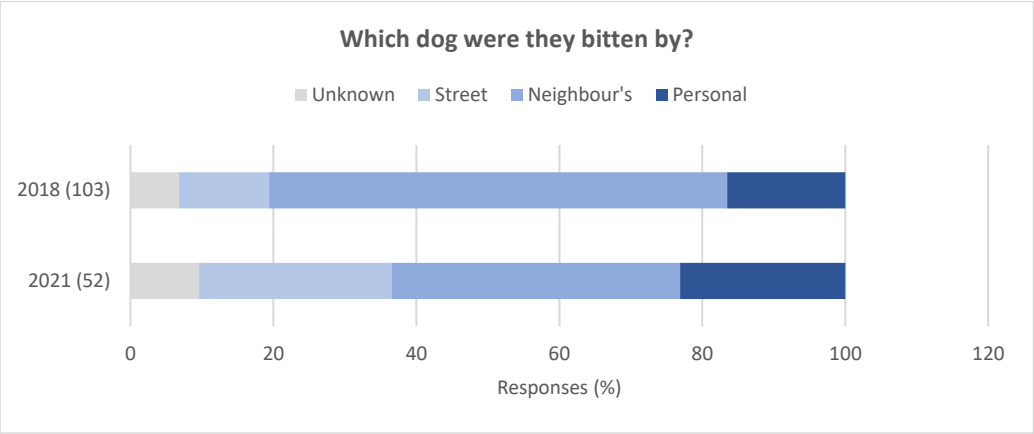
Human-dog conflict

The perceived threat of street dogs appears to have declined between 2018 and 2021, with the number of responses not noting a threat rising from approximately 50% to 70%.

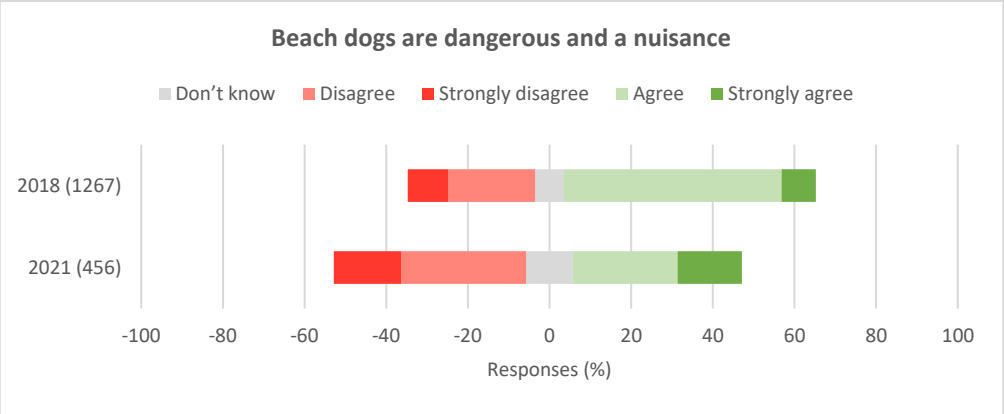


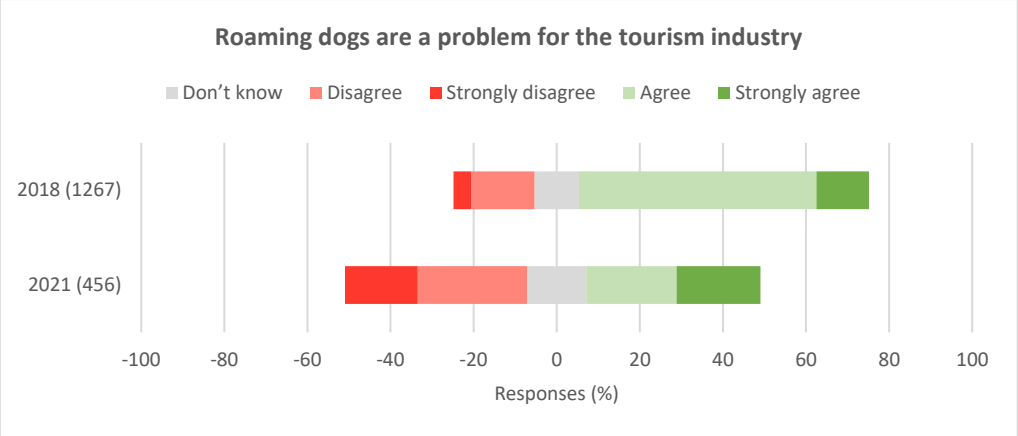
In 2018, 102 of 1267 (1 'don't know' response excluded) respondents reported dog bites (8.1%) within their household. In 2021 was roughly similar at 10.2% (46 of 450; 6 exclusions). There was no significant difference: X-squared = 1.4169, df = 1, p-value = 0.2339. A greater proportion of these bites were received from owned dogs in 2018 than in 2021, perhaps

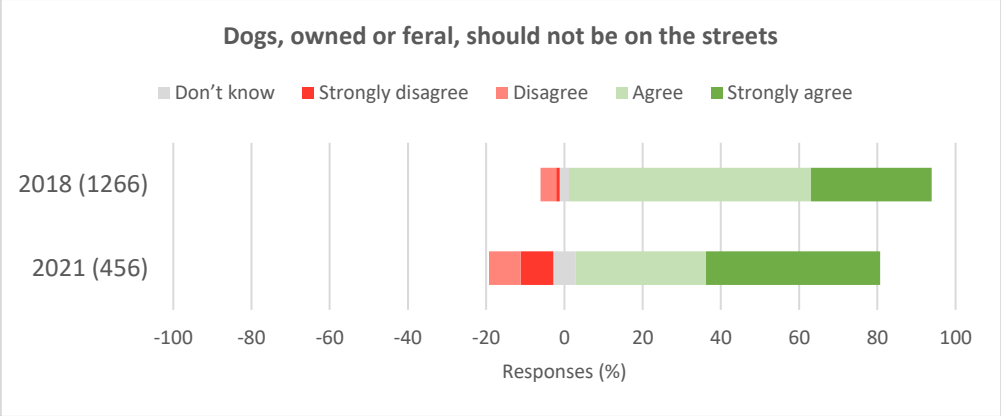
indicating either a better relationship with owned dogs in 2021, or perhaps a greater interaction with unowned dogs that led to more bites from this cohort in 2021.

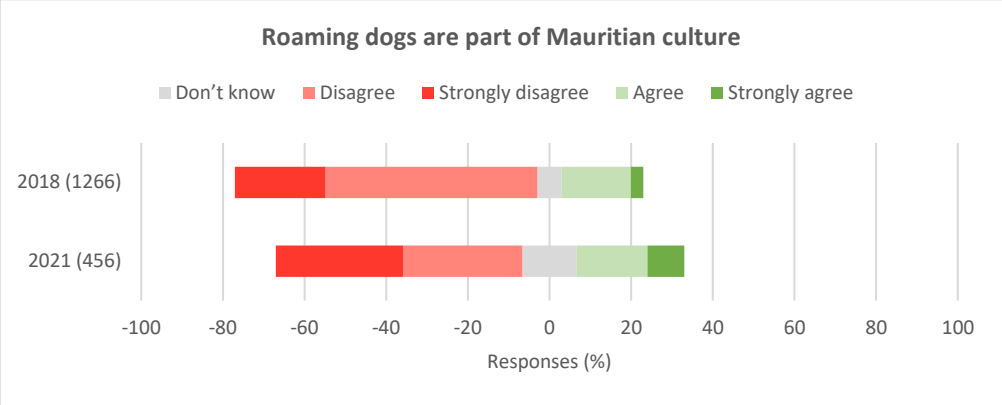


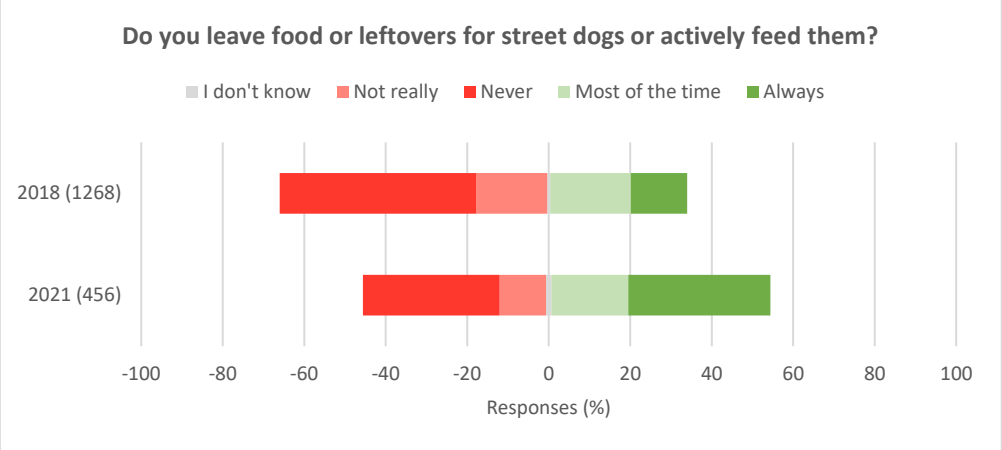
Attitudes towards dogs











Overall, there appears to be a general shift towards more positive attitudes to roaming dogs and dogs in general between 2018 and 2021, as well as increased street-dog provisioning frequency. These findings fit with the increase in dog ownership proportions (described above). Given the dramatic increase in public awareness of HSI (as reported above), it appears likely that the program had some role to play in this shift.

Discussion and Recommendations

Following HSI's pilot survey in 2018, in which the baseline state of the roaming dog populations of Flacq District were ascertained and programme approaches outlined to deal with both owned and unowned populations, this final report sheds light on the efficacy of the programmes implemented and the effect of HSI clinic presence on local attitudes and practices towards dogs.

Data from street dog surveys suggests that sterilisation programmes were highly effective in increasing the proportion of sterilised dogs in the population, both within and outside of project areas (it is notable that many individuals in non-project areas may have travelled to project clinics to owned dogs), as well as on public beaches. Indicators of poor dog welfare dropped over the period of clinic operation, suggesting a positive effect of sterilisation on dog population welfare, as may be expected. Reproductive indicators however did not decrease in Flacq, likely due to the fact that sterilisation proportions did not reach the threshold levels required for a drop in reproductive capacity—a dynamic supported by HSI operations and analysis elsewhere. The exception was on public beaches, where sterilisation rates reached much higher levels, and a consequent dramatic decrease in reproductive indicators was observed. Regardless, an overall drop in total dog abundance based on survey counts was observed in all survey regions.

Unfortunately, however, with the exception of Palmar public beach (see earlier note on sample size), sterilisation proportions dropped rapidly after cessation of the programme in 2020, and total abundance, reproductive and poor welfare indicators rose again in all survey regions in which they had previously decreased. This indicates that, as may be expected in reference to the sub-critical sterilisation threshold levels reached, the proportion of sterilised roaming dogs at the point of programme cessation was too low to enact any lasting change. It is predicted that sterilisation proportions, reproductive dynamics and poor welfare indicators will revert to baseline levels within a few of years without further intervention. In short, a greater cumulative sterilisation effort is required for lasting population management.

On a more positive note, the comparison between 2018 and 2021 household KAP surveys show encouraging results. In general, attitudes toward and relationships with owned and unowned dogs appear to have improved on almost all accounts measured since 2018, with lower reports of human-dog conflict, generally more positive views on roaming dog populations, and a greater proportion of the population considering their dogs to be pets and companions in addition to working animals. It is expected that these trends will continue improve inter-species relationships and the welfare of the dog populations in question.

To conclude, it is our recommendation that the Mauritian government should capitalise on the trend toward human-dog positivity that HSI's programme has initiated, by continuing the message of amicability between human and dog populations and encouraging the sterilisation of all owned animals. However, beyond generally improved relationships and welfare of owned dogs specifically, our surveys and global research suggest that for any significant reduction in roaming dog abundance and poor welfare to be enacted, a further, and likely more intensive (or better, long-term), sterilisation programme will need to be implemented in order to achieve the proportions of sterilisation required for long-term effect.

Appendix

Free roaming lactating female dog on public beach during the weekend