

## Estimativa da População Canina e Felina em um município do Semiárido nordestino: uma visão sobre a guarda responsável

*Estimate of the canine and feline population in a municipality of the northeast semi-arid: a view on responsible owner ship*

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### ABSTRACT

The quality of life of animals can have a direct impact on the health of the community where they live, therefore, knowledge of the number of animals and the conditions in which they are found is fundamental to the development of actions focused on Unique Health. Aiming to carry out a population estimate of dogs and cats, domiciled and semi-domiciled, in the urban area of Barra-BA and to analyze the population's knowledge about the themes "responsible guarding" and "animal welfare", it was carried out, in the period of August to November 2019, the application of a questionnaire in 365 residences. The results showed that for each inhabitant there were about 0.152 dogs and 0.108 cats, thus, it is estimated about 6,341 domesticated and semi-domesticated animals, being 3,707 dogs and 2,634 cats. The analysis of notions of animal welfare and responsible guarding showed that most tutors do not satisfactorily practice responsible guarding, especially for cats that, when compared to dogs, had lower rates of deworming and vaccination, as well as average age below that of the canine population. The number of animals with free access to the street was higher for felines. In terms of reproductive control, between the two species, only 3.6% were spayed. At the end of the work, it can be concluded that the cat: inhabitant proportion in the studied region is consistent with the national proportion. In contrast, the dog: inhabitant relationship was shown to be inferior when compared to national values. Furthermore, there was a need for educational actions within the scope of responsible custody.

**Keywords:** Animal population estimate; Human-animal interaction; Animal welfare

## RESUMO

A qualidade de vida dos animais pode ter impacto direto na saúde da comunidade onde vivem. Portanto, o conhecimento do número de animais e das condições em que se encontram é fundamental para o desenvolvimento de ações voltadas para a abordagem Saúde Única. Com o objetivo de realizar uma estimativa populacional de cães e gatos domiciliados e semidomiciliados na área urbana de Barra-BA, e analisar o conhecimento da população local sobre os temas “guarda responsável” e “bem-estar animal” foi realizado um questionário em 365 residências no período de agosto a novembro de 2019. Os resultados mostraram que para cada habitante havia cerca de 0,152 cães e 0,108 gatos. Assim, estima-se que existam cerca de 6.341 animais domesticados e semi-domesticados, sendo 3.707 cães e 2.634 gatos. A análise do conhecimento sobre bem-estar animal e guarda responsável mostrou que a maioria dos tutores não pratica a guarda responsável de forma satisfatória, principalmente para gatos. Quando comparados aos cães, os gatos apresentaram menores índices de vermifugação e vacinação e apresentaram idade média abaixo da população canina. O número de animais com livre acesso à rua foi maior para os felinos. Em termos de controle reprodutivo, entre as duas espécies, apenas 3,6% foram esterilizadas. Ao final do trabalho, pode-se concluir que a proporção gato por habitante na região estudada é condizente com a proporção nacional. Em contrapartida, a relação cão por habitante mostrou-se inferior aos valores nacionais.

**Palavras-chave:** Estimativa de população animal; Controle populacional de cães e gatos; Interação homem-animal

## INTRODUCTION

Humans domesticated the dog about 10,000 years ago, cats have a more recent history, 4,000 years ago (Bergström et al, 2020). This interaction occurred initially for the purpose of pest control, protection of the home and even as a deity, as is the case with the cat with Egyptian civilization (Lima, 2012). However, over the years, there has been a change in the dynamics of the human-animal relationship, especially in the case of dogs and cats that have increasingly ceased to be seen as pets and have become members of the multispecies family (Irvine&Cilia, 2017; Faraco, 2010).

The search for pets within the family contributed to reaching the mark of 52.2 million dogs and 23.9 million cats in Brazil (IBGE,2013).The health and well-being of these animals then reach a focal point, since any neglect in the

conditions in which these animals are raised can predispose humans to different zoonoses, diseases transmitted between humans and animals (Mello & Scharfy, 2016). The practice of responsible ownership translates the notions of respect and ethics of a society towards pets (Jorge et al., 2018), presenting it as a preventive alternative by means of such notions, guardians understand the needs of animals and guarantee the five freedoms of well-being (Freedom from hunger and thirst, from discomfort, pain, injury and disease, freedom to express your natural behavior, not showing fear and distress) contributing to control the spread of zoonoses (Pedrassani&Karvat , 2017). Amid the high number of dogs and cats in the country, it is important to know the distribution of these animals in the municipalities for the purposes of health control and the regulation of laws that guarantee well-being (OIE, 2021

&Jorge et al., 2018). The estimation of the animal population and the knowledge related to its well-being can assist in the process of planning actions aimed at improving the living conditions of the individuals that compose it (IBGE, 2013). Thus, this study presents data on the population of dogs and cats in the urban area of the municipality of Barra, west Bahia, and analyzes the knowledge of tutors on the themes "responsible guarding" and "animal welfare".

## DECLARATION OF ETHICS

The research was carried out under the approval of the UFOB Research Ethics Committee (protocol 39839220.8.0000.8060).

## METHODOLOGY

### 1. Characterization and location of the study

Where,  
n: sample number, N: number of households,  $p$ : probability of finding the animal in the household,  $q$ : probability of not finding the animal in the household ( $1 - p$ ), Z: critical value of the degree of confidence, E: margin chosen error.

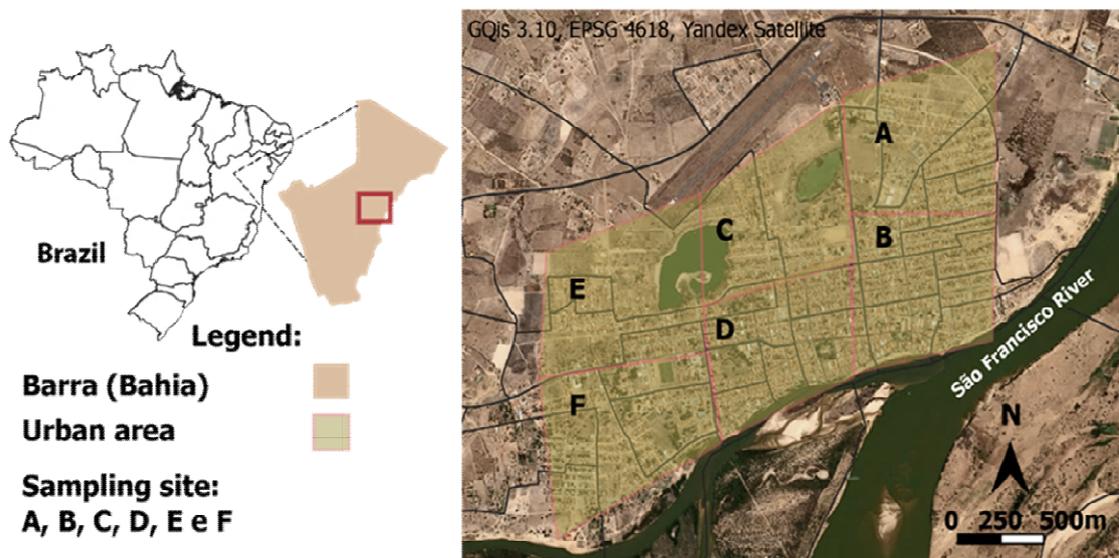
The data were obtained between August and November 2019 through the application of a semi-structured questionnaire to residents of the urban area of the municipality of Barra, located in the semi-arid region of the western region of the state of Bahia. Barra is located in the transition region between caatinga and the cerrado and is characterized by its large territorial extension (11,422,537 km<sup>2</sup>), with about 54,225 inhabitants, most of which are in the rural area (IBGE, 2021).

### 2. Sampling

The study region was divided into six strata (A - F), according to the volume of residences, in order to match the number of houses in each area, adopting stratified probability sampling, in order to obtain proportional and representative data (Figure 1). The following equation was used to calculate the number of homes to be visited:

$$n = \frac{N \cdot \hat{p} \cdot \hat{q} Z^2}{\hat{p} \hat{q} Z^2 + (n-1) E^2} \text{(Equation 1)}$$

After estimating the number of households in the region, it was considered, for calculation purposes, that 44.3% of Brazilian households have at least one dog / household (IBGE, 2013). The other variables were defined considering an estimated error of  $\alpha$  of 5%.



**Figure1:** Geographical stratification of the map of Bahia, with emphasis on the urban area of the Municipality of Barra, which is subdivided into six strata classified as A, B, C, D, E and F. SOURCE:personal archive (2020).

Sample size was calculated based in the estimated number of households (7.518). Thus 365 households have been determined to be visited, proportionally distributed in each of the strata, with the household selection guided by drawing lots. 50% of the number of houses was added, to serve as a reservation in residences where the resident's absence occurred after two visits, be it a commercial point, a house without a resident, constructions or absence of interest on the part of the resident.

### 3. Application of questionnaires

In each residence visited, only one individual ( $\geq 18$  years) answered the questionnaire containing 11 questions organized in 3 sessions: i) general data of the interviewee (name, address, age, level of education and number of residents in the residence); ii) animal data (number of animals, age, place of stay, bathing frequency, reproduction control and type of food) and iii)

specific data of the participant and the neighborhood in which he lived (presence of animals loose on the street, history of accident with animals, interest in participating in future research).

The applications of the attempts occurred on weekends between 9:00 am and 11:00 am and 2:00 pm and 6:00 pm, being modified when there were sessions by the participants of a specific day/time for conducting the interviews.

### 4. Data analysis

To obtain the animal population estimate, the animal: inhabitant relationship was established, which was then multiplied by the estimated population, based on the IBGE (2019) projection, in the urban area of the municipality. Descriptive statistics was used to describe and summarize the data set according to the thematic axes, as well as inferential statistics. For

descriptive analyzes, Microsoft Office Excel (2013) was used. Associations and correlations between variables were performed using Fisher's exact test and Spearman's coefficient, both using the GraphPad Prism 8 program (GraphPad Software, USA, 2018).

## RESULTS AND DISCUSSION

A total of 365 homes were visited. Among respondents, 66% were female, 18.4% aged between 36 and 45 years. As for education, it was observed that about 54.2% of participants did not complete their studies and only 7.4% had completed higher education (Table 1). In addition, according to the IBGE (2018), only 5.6% of the population in the municipality of Barra do formal jobs.

**Table 1-** Data from respondents from the municipality of Barra in the Western Region of Bahia, from August to November 2019, for a sample survey of the canine and feline population and their implications for the responsible guarding of these animals.

Variable	Category	Number	Percentage
Sex	Female	241	66,0%
	Male	124	34,0%
Education	No instruction and incomplete elementary school	142	38,9%
	Complete elementary school and incomplete high school	56	15,3%
	Complete high school and incomplete higher education	138	37,8%
	Complete higher education	27	7,4%
	Not determined	2	0,6%
Number of residents per residence	1	28	7,7%
	2 to 3	156	42,7%
	4 to 5	124	34%
	Above 5 people	57	15,6%
Respondent age	Uninformed	36	9,9%
	15 to 25 anos	65	17,8%
	26 to 35 anos	67	18,4%
	36 to 45 anos	69	18,9%
	46 to 55 anos	53	14,5%
	56 to 65 anos	37	10,1%
	Above 66 years	38	10,4%

Among the households visited, 53.2% had an animal, 38.6% with at least one dog and 27.9% with at least one cat. The values are compatible with those presented in the National Health Survey (PNS) carried out in the Northeast region of the country in 2013, in which dogs occupied 36.4% of households and cats 23.6% (IBGE, 2013). The higher prevalence of dogs compared to cats was also found in several studies in Brazilian municipalities (Catapan et al., 2015; Cardoso et al., 2016; Magalhães et al., 2016; de Sá et al., 2020). In this sense, it is important to emphasize that in our literature review, we did not find studies that carried out population estimates of animals, linked to an analysis of the conditions of responsible custody in a municipality located in the Sertão Northeast. Thus, according to the

discussions carried out in this work, with a comparison of our results with studies carried out in different conditions, they must be contextualized considering the socio-economic and cultural differences that exist in Brazil. 216 dogs and 154 cats were registered, totaling 370 animals (Table 2). Buying animals was an option for 20% of dogs and 0.7% of cats. This disparity in obtaining animals probably occurs because dogs, from the beginning, were seen as friends of man when compared to the feline species (Bergström et al., 2020), in addition, dogs have greater variability in size and behavior, therefore, these animals are more susceptible to segregation by breed in order to preserve traits of interest (Toson et al., 2017).

**Table 2-** Total households by stratum in the urban area of the municipality of Barra, with details of inhabitants visited by residence and animal/inhabitant ratio in the municipality, West Region of Bahia, between August and November 2019

Extract	Houses visited	Houses	Population	Number dogs/*ratio	Number cats/*ratio
A	63	1308	275	35/0,127	21/0,076
B	72	1479	264	44/0,166	32/0,121
C	59	1224	212	31/0,146	30 / 0,141
D	58	1184	210	39/0,185	15/0,071
E	46	947	190	34/0,178	22/0,115
F	67	1376	266	33/0,124	34 / 0,127
<b>Total</b>	<b>365</b>	<b>7518</b>	<b>1417</b>	<b>216 / 0,152</b>	<b>154 / 0,108</b>

\* ratio of animals per 1 inhabitant

In addition to the total number of dogs and cats, the number of residents in the households visited was also recorded so that it would be possible, a posteriori, to

estimate the animal/inhabitant ratio. The average number of dogs and cats in the households visited was estimated at 1.74 for dogs and 1.51 for cats.

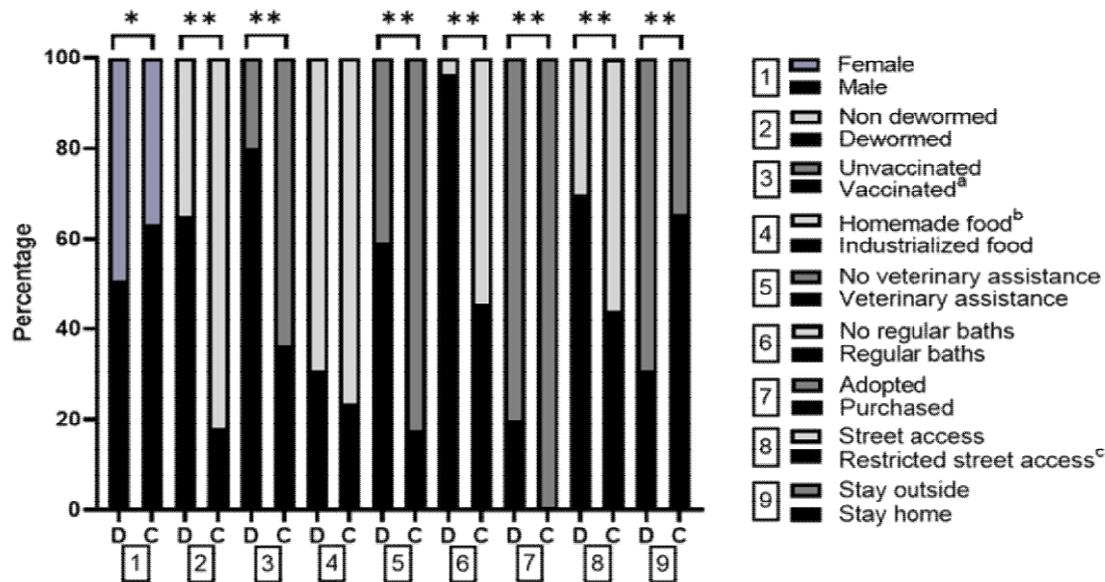
Comparing with the national averages, whose estimates were 1.80 dogs and 1.90 felines per household, it appears that the average number of cats per household in the municipality in question is sufficiently lower (IBGE, 2013).

According to table 2, a proportion of approximately 0.152 dogs and 0.108 cats for each 1 inhabitant in the study area was estimated. In 2019, Brazil had about 210,147,125 inhabitants (IBGE, 2019) and, according to Abinpet, 2019, 55.1 million dogs and 24.7 million cats. Thus, it is estimated that, in the country, in 2019, there were about 0.262 dogs and 0.117 cat for every 1 inhabitant. Therefore, the cat: inhabitant ratio in the region studied is close to the national proportion, unlike the dog: inhabitant ratio, which presented lower values when compared to national values.

Based on the IBGE projection for 2019, the urban area of the municipality of Barra had around 24,382 inhabitants. Thus, after multiplying the animal: inhabitant ratio of the studied area by the projection of the number of inhabitants (Table 2), approximately

3,707 dogs and 2,634 cats were estimated, which totals around 6,341 domiciled and semi-domiciled animals in the study region. In addition to the number of animals, some variables of the population of dogs and cats were also analyzed, as well as the practice of responsible custody by guardians (Figure 2).

The percentage between male (50.9%) and female dogs (49.1%) is similar (Figure 2), different from that found in Coquimbo, Chile, with 56–84% of male dogs reported (Acosta-Jammet et al. , 2010). However, a higher frequency of males (63.3%) was observed among felines. The choice of the pet's gender can be influenced by the reproductive behavior of each species (Gebremedhin et al., 2020), especially when it comes to cats, since most of the time they are considered semi-domiciled animals, which can trigger offspring undesirable, explaining the higher rate of males observed in population estimation studies of animals in different cities in the country (Canatto et al., 2013; Silva et al., 2020) and also in the municipality of Barra.



**Figure 2-** Description of the canine and feline population in a city in the Brazilian semi-arid region regarding sex (1), deworming (2), vaccination (3), type of food (4), veterinary care (5), bathing (6), form of acquisition (7) and location of animals (8 and 9).

D: Dog; cat C; \* statistical difference by Fisher's exact test ( $p < 0.05$ ); \*\* statistical difference by Fisher's exact test ( $p < 0.0001$ ); a. This category includes animals vaccinated with complete or incomplete vaccination protocol; b. This category includes animals that are fed only with homemade feed or with homemade and industrialized feed; c. This category includes animals without access to the street or animals with access to the street accompanied by the guardian.

Regarding the vaccination variable, it was shown that more than 80% of the dogs and 36% of the cats received at least one dose of anti-rabies or a dose of polyvalent (Figure 2), with only 28.7% of the dogs and 9.1% of cats had a complete vaccination protocol. Therefore, the chance of a dog being vaccinated in the municipality of Barra is 7,041 times larger when compared to that of a cat. The percentage of animals that received at least the anti-rabies vaccine was 62% for dogs and 34.4% for cats, below the values found by

Corrêa and Freire (2009) in the metropolitan region of Rio de Janeiro, where vaccination coverage was 87.3% for dogs, while for cats it was 49%. This low rate of felines that received the anti-rabies vaccine may be related to the lack of knowledge on the part of the population, regarding the anti-rabies vaccine theme, since most of the population of Barrense has a low level of education (Table 1) in which, regarding the form of transmission of rabies, currently, the dog is the main responsible for the transmission of urban rabies. However, according to Lages (2009), cats have come to stand out as transmitters over the years.

Animal vaccination is extremely important, as it helps control zoonoses such as rabies, a very important and neglected viral infectious disease in which dogs are still considered the main transmitters of urban rabies to humans (Lages, 2009). Another possible explanation for these data is the fact that the handling of cats is more complex when compared to that of dogs, as

reported by Magnabosco (2006), who observed similar data in his study in the city of São Paulo/SP and correlated them to the fact that vaccination campaigns are, like those that take place in the city of Barra-Ba, in environments where there is a large circulation of people and dogs, and this negatively influences the guardian's decision to take their cats, since these conditions are highly stressful and offer risks to these animals, thus influencing the low rates of vaccinated cats.

Regarding deworming, the rate of animals dewormed was 65.3% for dogs and 18.2% for cats. The chance of a dog being dewormed is 8.46 times greater than that of cats. We believe that the low cost of deworming contributes to the increase in the number of dewormed dogs. As for felines, the low deworming rate may be related to greater difficulty in administering the product, associated with the fact that tutors see cats as independent animals and more resistant to diseases (Machado & Paixão, 2014), since these conditions are highly stressful and offer risks to these animals, thus influencing the low rates of dewormed cats.

We recorded that 59.3% of dogs and 17.5% of cats received some type of veterinary care (Figure 2). Spearman's coefficient (CS) showed a positive correlation between the variables veterinary care and deworming ( $p < 0.001$ ; SC 0.563); and veterinary care and vaccination ( $p < 0.001$ ; CS 0.761), reinforcing the importance of the veterinarian for guidance on sanitary and preventive management, which reflects on the quality of life of animals and humans, since diseases, mainly zoonoses, can be avoided (CFMV, 2018).

As shown in Figure 2, with regard to food, 29.2% of the dogs and 60% of the cats were fed with homemade food, this

result may be related to income, considering that a small portion of the population of the municipality of Barra (5,6%) performed formal work (IBGE, 2017). The idea that industrialized foods are harmful to animals can influence guardians in the decision to use homemade food to feed their pets, as well as financial factors can interfere in the quality of food provided to dogs and cats (Jardim et al., 2019) nutritional, metabolic and/or infectious changes in these animals. However, Viegas et al (2020), pointed out that the ingestion of raw or poorly prepared food increases the risk of fecal elimination of pathogens, representing a risk to animal and public health as well as providing the appearance of nutritional, metabolic and/or infection disorders in these animals.

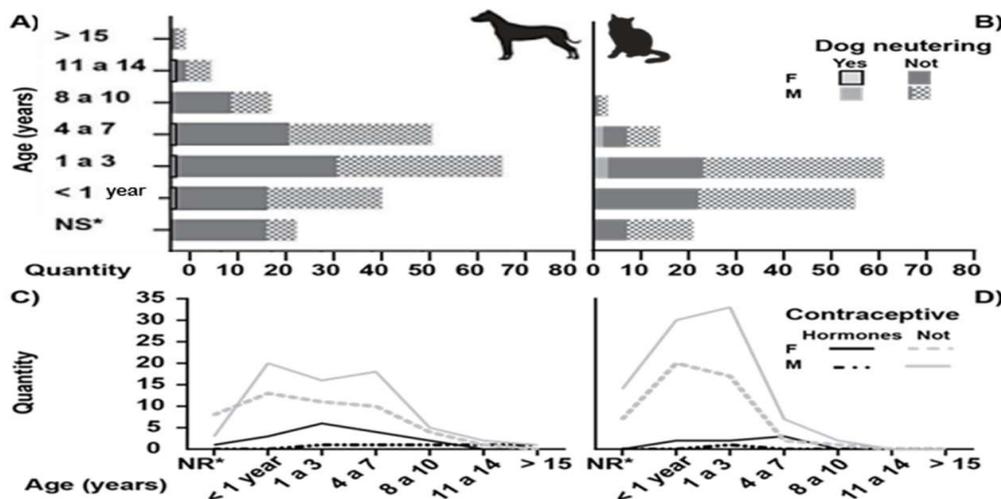
As for bathing, it was found that 46% of cats and 96% of dogs had access. The low rate for felines may be related to the common sense that cats have an aversion to water, associated with their self-cleaning habit, in addition to the difficulty in handling the species (Machado & Paixão, 2014). However, the lack of bathing in dogs can negatively influence their health, as hygiene care prevents and minimizes infestation by fleas, lice and ticks, reducing the risk of diseases in both animals and humans (WSAVA, 2018; Loss et al., 2012).

The life expectancy of dogs and cats can vary according to breed and handling, with an average of 15 years (Oliveira, 2019). Regarding the age factor, 30.1% of the dogs and 39.3% of the cats were between 1 and 3 years old, and only three dogs (1.4%) were over 15 years old, configuring a high frequency of dogs and cats young and low longevity among the animals (Figure 3). The average age found in cats from Barra is similar to that of cats

from the city of São Paulo (3.53 years), a Brazilian megalopolis (Canatto, 2013; Oliveira-Neto et al., 2018).

Regarding the sterilization variable (Figure 3), a considerably low rate was observed. It was observed that in males, both canines and felines, the percentage of non-sterilized animals was greater than 94%. Being verified which tutors controlled the reproduction of their animals and which contraceptive methods were most used. Among all 102 dogs analyzed in this variable, only 4 were neutered, while among all 55 cats, none had been neutered. Unlike what was found in the feline population by Lages (2009) in Jaboticabal-SP, where it was found that 58.75% of cats

in the neighborhoods were sterilized. It is important to highlight that in Barra-BA, sterilization services began to be implemented in mid-2018, with the start of teaching activities for surgical techniques in the Veterinary Medicine course at UFOB, unlike the municipality of Jaboticabal, which already has established the Veterinary Medicine course since the 60's. Therefore, the low number of sterilized animals in the region studied may be related to limited resources and manpower, associated with the relatively recent offer of the surgical sterilization procedure.



**Figura 3-** Correlation between sex and age in the variables sterilization and contraceptive method based on an estimate of the canine and feline population in Barra, Bahia.

A) number of spayed and non-sterilized dogs by sex and age; B) number of sterilized and non-sterilized cats by sex and age; C) main contraceptive methods used in dogs by sex and age; D) main contraceptive methods used in cats by sex and age. It was found that at least 30% of dogs and 54% of cats have free

access to the street, contrary to the responsibilities of a responsible guard (Figure 2), which, associated with the high rate of animals with reproductive potential, favors uncontrolled reproduction. Alves et al., (2005) reported that the smaller the city, proportionally the smaller the territorial

control of the animals, which allows justifying the number of semi-domiciled animals in the region studied. The number of cats with access to the street is higher than that of dogs, which may be a determining factor in the low proportion of animals over 4 years old, suggesting a lower longevity of cats in the municipality. The number of semi-domesticated animals may be a factor in reducing the rates of elderly people, since animals with free access to the street are less long-lived when compared to domiciled ones, as they are subject to the risk of being run over, attacked and poisoned (Harvey; Campos Junior; Cardoso, 2012).

We believe that the number of dogs and cats with access to the street, associated with a high rate of animals with reproductive potential, leads to the rate of young individuals observed. In addition, a high rate of perception of animals on the streets by the interviewees was expected, which was confirmed when it was found that, on average, 87.2% of the participants complained about the release of animals in the neighborhoods. This perceived perception of animals on the streets reinforces the need to implement public policies to raise awareness of animal welfare and the risks of spreading zoonoses.

Considering the results obtained, the dog: inhabitant and cat: inhabitant ratio may vary according to the region studied, making it necessary to know the canine and feline population to be inferred. Recognizing that Barra-Ba is an inland city, with a population with a low level of education and a low rate of inhabitants who carry out formal work, the need for educational actions within the scope of canine and feline management is reinforced, to reduce the participation or prevent the population from the process of spreading

zoonoses. The knowledge about the practice of responsible ownership and the notions of animal welfare by the population, presented here, can be used in the planning of public actions aimed at maintaining the One Health approach, mainly because this is the first local survey that gathers data on the quantity and profile of the population of dogs and cats in the municipality, since there are still few studies in the literature with municipalities with similar characteristics.

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