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Effective methods for population control in dogs and cats in the municipality of Salinópolis, Pará

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Abstract. In Brazil, the population of dogs and cats is growing exponentially, causing adverse public and environmental health problems. The multiplication of these stray animals results in an increase in abandonment and mistreatment, also facilitating the proliferation of zoonoses, causing impacts on human health. Surgical sterilization, along with educational programs aimed at the populace, promotes awareness among owners regarding responsible ownership and can largely solve these problems, especially through greater incentives from public policies. In view of the above, this study aimed to demonstrate the effectiveness of neutering programs for dogs and cats with the aim of controlling their population, focusing on the One Health approach. On November 15th, 16th and 17th, 2019, the Veterinários da Amazônia group carried out a free surgical sterilization action in the municipality of Salinópolis, Pará (Brazil), using the minimally invasive technique with a snook hook for ovariohysterectomy in female felines and canines, pre-scrotal orchiectomy in male canines, and scrotal in male felines, resulting in 98 sterilizations, 55.1% canines and 46.9% felines, demonstrating a greater demand for the castration of female animals. Based on this, it is estimated that approximately 1,152 puppy and kitten births were prevented annually by the sterilization campaign in the municipality of Salinópolis (PA), 576 of which were felines and 576 dogs, representing an impact of approximately 16.52% on the feline community and approximately 6.27% on the canine community of the municipality. These data indicate that the campaign was of great importance in reducing the birth rate, contributing significantly to the control of the stray animal population and to the promotion of animal welfare in the region. However, for effective birth control, greater awareness of the populace regarding responsible guardianship as a predominant factor in animal welfare and subsequently the reduced abandonment of dogs and cats is required.

Keywords: Castration, overpopulation, public health, sterilization, zoonosis

Métodos eficazes para o controle populacional de cães e gatos no município de Salinópolis, Pará

Resumo. No Brasil a superpopulação de cães e gatos está se expandindo de modo exponencial, ocasionando adversidades à nível de saúde pública e ambiental. A multiplicação desses animais errantes resulta no aumento de abandono e maus tratos,

facilitando, também, a proliferação de zoonoses, ocasionando impactos na saúde humana. A esterilização cirúrgica, ligada a programas educativos, voltados à população, promove a conscientização de tutores quanto a guarda responsável e pode resolver, em boa parte, estes problemas, sobretudo através de maiores incentivos de políticas públicas. Diante do exposto, o presente trabalho objetivou demonstrar a eficácia de programas de castração de cães e gatos com o objetivo de controlar esta população, com foco na abordagem à saúde única. Nos dias 15, 16 e 17 de novembro de 2019, o grupo Veterinários da Amazônia, realizou uma ação de esterilização cirúrgica gratuita de no município de Salinópolis, Pará, com emprego da técnica minimamente invasiva com gancho de *snook* para ovariossalpingohisterectomia nas fêmeas felinas e caninas, e orquiectomia pré escrotal em machos caninos, e escrotal em machos felinos, resultando em 98 esterilizações, sendo 55,1% caninos e 46,9% felinos, demonstrando maior procura pela castração de animais fêmeas. Com base nisso, estima-se que foram evitados anualmente cerca de 1.152 nascimentos de filhotes de cães e gatos com a campanha de esterilização no município de Salinópolis - PA, sendo 576 felinos e 576 cães, representando um impacto de aproximadamente 16,52% na comunidade felina e cerca de 6,27% na comunidade canina do município. Tais dados indicam que a campanha foi de grande importância na redução da taxa de natalidade, contribuindo significativamente para o controle da população de animais de rua e para a promoção do bem-estar animal na região. Contudo, para um controle de natalidade efetivo, necessita de uma maior conscientização da população quanto a tutela responsável como fator predominante no bem-estar animal e posteriormente a redução de cães e gatos em situação de abandono.

Palavras-chave: Castração, superpopulação, saúde pública, esterilização, zoonoses

Introduction

The increase in the number of abandoned animals on the streets is mainly due to the lack of responsibility and knowledge on the part of the population, in addition to the absence of preventive actions by the government in relation to abandonment. This unbridled expansion in the reproduction of dogs and cats causes several problems for society and for the animals, which are exposed to various diseases, mistreatment, and zoonoses (diseases transmitted between humans and animals), the best-known being rabies, a viral infectious disease that develops quickly and is lethal, as well as leishmaniasis, leptospirosis, and toxoplasmosis, which are also considered zoonoses that cause great concern to public health ([Garcia, 2014](#); [Molento et al., 2005](#); [Paula, 2010](#); [Trautwein et al., 2021](#)).

[Vieira \(2008\)](#) points out that “female dogs and cats are multiparous animals with short gestations, with great potential to generate numerous offspring that can reach sexual maturity from six months of age, which causes the number of dogs and cats to gradually increase. Therefore, effective reproductive control actions must be implemented in conjunction with other pillars of the population control program, and the use of surgical sterilization of males and females with minimally invasive techniques is recommended. Sterilization is the best form of population control for dogs and cats. It is scientifically proven that sterilization is currently the only efficient alternative to control the overpopulation of dogs and cats in cities ([Catapan et al., 2015](#); [Hsueh et al., 2018](#)).

According to [Vieira \(2008\)](#), seeking a balance between human, animal, and environmental health is crucial since population control of dogs and cats is directly linked to public health. The World Health Organization states that activities involving the collection and elimination of dogs and cats are not effective for population control. Action must be taken on the cause of the problem: uncontrolled animal reproduction and the lack of human responsibility regarding their possession, ownership or care ([WHO, 1990](#)).

The pet population in Brazil is around 140 million animals (wild, exotic, and domestic), of which the majority are canines (54.2 million) and felines (23.9 million), for a total of 78.1 million animals. Of these animals, 5% are animals in vulnerable situations, which represents 3.9 million pets. Abandoned animals are not among the ACV, which are those that remain for a certain period without an owner ([Herron & Shreyer, 2014](#); [Leonard & Scammon, 2007](#)).

Overpopulation can cause harm to animal welfare, such as diseases, dietary restrictions, lack of or inadequate social interaction, poor housing conditions, inadequate handling, lack of veterinary care, or genetic alterations. In addition to welfare problems, the population of abandoned animals is a serious public health problem, as it generates injuries, environmental pollution, and transmission of zoonoses. The high population of dogs and cats, the lack of disease prevention and control, and the unfavorable living conditions of animals increase the risk of transmission of zoonoses ([Langoni & Fornazari, 2014](#)). Overpopulation also causes traffic accidents, infections, psychological trauma, injuries, mutilations, and even death. In Brazil, the incidence of human accidents caused by animals, especially dogs, is significant ([Fossum, 2021](#); [Jardim et al., 2017](#)).

[Garcia \(2014\)](#) present population control through surgical sterilization, demonstrating its relevance since other control techniques have proven to be costly and inefficient. In addition to efficient reproductive control, surgical sterilization prevents diseases of the reproductive organs, in addition to improving the behavior and quality of life of animals ([Alves & Hebling, 2020](#); [Carvalho et al., 2021](#); [Catapan et al., 2015](#); [Fossum, 2021](#)). Castration is an effective alternative in population control of dogs and cats, as it helps to reduce birth rates without violating animal rights and welfare ([Alves & Hebling, 2020](#); [Seid & Terefe, 2019](#); [Silva et al., 2021](#)).

There is a group of zoonotic infectious diseases known as "neglected zoonotic diseases." These diseases may present clinical symptoms that can be confused with common human diseases, which can lead to underreporting. Brucellosis, leishmaniasis, and tungiasis, among others, constitute a major health problem. In the world, particularly in tropical countries, public control is limited due to the lack of infrastructure, limited resources, and the lack of information about the relevance and distribution of these diseases ([Costa et al., 2021](#)).

The objective of this research was to highlight the importance of sterilization actions for dogs and cats in the municipality of Salinópolis, Pará.

Material and methods

Ethical aspects

The castration action developed by the Veterinários da Amazônia group is for population control of dogs and cats with application in One Health, under authorization from the Ethics Committee on the Use of Animals of the Federal Rural University of the Amazon (n° 23084.010805/2017) and the Brazil Certificate of Presentation of Ethical Appreciation platform (n° 70516021.4.0000.0018).

On November 15, 16, and 17, 2019, a population control action for dogs and cats was carried out in the municipality of Salinópolis, located in the Northeast of Pará. On the first day of the action, November 15, 2019, an educational lecture was held (Figure 1A) discussing the topics of animal welfare, responsible ownership, basic animal health care, such as vaccination, deworming, and the occurrence of zoonoses, which can directly influence family health, and the registration of the animals was carried out. The same animals eligible for castration were taken on the 16th and 17th of the same month, when the surgical sterilization procedure orchietomy and ovariosalpingohysterectomy (OSH) was performed (Figure 2). Afterwards, the guardians were instructed on pre- and post-operative care.

At this first stage, the animals were clinically evaluated by campaign veterinarians, and the animals suitable for the surgical procedure were selected. The owners were registered and provided information about their animals through a questionnaire. They were then informed about the Free and Informed Consent Form (FICF), certifying their understanding of the procedures and their imminent risks.

The animals were then taken to the preparation area (Fig. 1C-D), weighed and restrained correctly, followed by administration of preanesthetic medication (PAM). The combination of morphine (0.5 mg/kg) + acepromazine (0.05 mg/kg) + xylazine (0.5 mg/kg) + ketamine (2 mg/kg) was used for dogs, and the combination of acepromazine (0.05 mg/kg) + tramadol (3 mg/kg) + ketamine (2 mg/kg) for cats. The animals also received preoperative administration of antibiotics based on veterinary Pentabiotic[®], anti-inflammatory meloxicam 0.2% (0.2 mg/kg). After an average time of 10-15 minutes after the application of PAM, the animals were accessed through cephalic venipuncture, and fluid therapy with NaCl 0.9% was performed to maintain venous access. For induction and maintenance of anesthesia in

felines, a combination of midazolam (0.5 mg/kg) + ketamine (10 mg/kg) was used, and in canines, diazepam (0.5 mg/kg) + ketamine hydrochloride (10 mg/kg). The animals were then taken to the operating room for sterilization.



Figure 1. Dog and cat castration drive in Salinópolis, Pará. **A.** Educational lecture. **B-D.** Organization and preparation of animals. **E-F.** Animals in post-operative period.

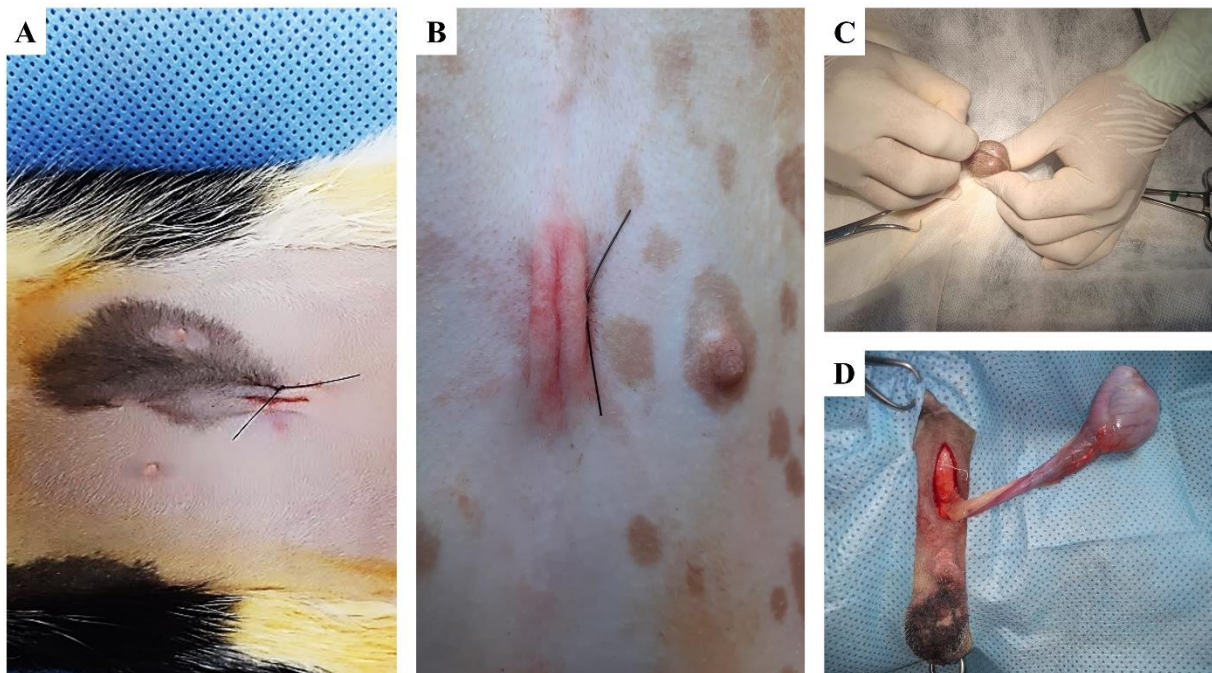


Figure 2. Castration surgeries in dogs and cats. Completion of surgical intervention. **A.** Feline. **B.** Canine. **C.** Scrotal incision line in feline. **D.** Prescrotal incision line in canine, and closed orchiectomy.

Surgical interventions were performed by veterinarians properly registered with the Regional Council of Veterinary Medicine, with assistance from interns from the veterinary medicine course at UFRA and other veterinary medicine schools. The techniques used were prescrotal orchiectomy in male dogs, scrotal orchiectomy in male cats, and ovariosalpingohysterectomy (OSH) in females using the Snook hook, employing the minimally invasive technique in accordance with the description of [Migliari & Vuono \(2000\)](#).

After surgery, the animals were sent to the post-surgical recovery area (Figure 1E-F), where parameters such as heart rate, respiratory rate, and rectal temperature were measured. When all parameters were normal, the animal was released. The surgical wound was also dressed and cleaned. Upon release, the owners were instructed to remove the surgical stitches 10 days after surgery. They also received a prescription for dipyrone (25 mg/kg). Animals with reproductive pathologies such as pyometra or dystocia received a prescription for antibiotics, anti-inflammatory drugs, and analgesics (Figure 3).

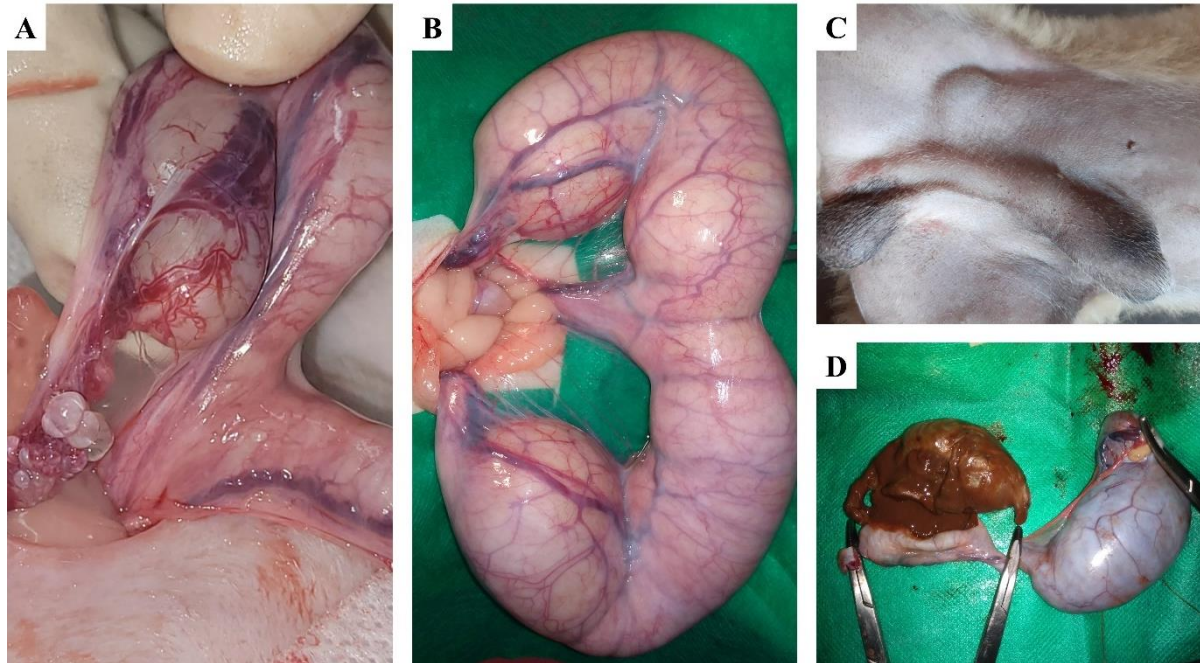


Figure 3. Reproductive pathologies were identified during surgical sterilizations of dogs and cats. **A.** Cysts in the ovarian sac of a feline. **B.** Uterine infection in a feline. **C.** Unilateral cryptorchidism of a dog. **D.** Macerated fetus in a feline.

Results and discussion

The Amazon Veterinarians group performed clinical evaluations on many animals to determine whether they were suitable for surgical procedures. In total, 98 animals were castrated, excluding those considered unfit due to heart disease, respiratory problems, apathy, cachexia, dehydration, gastroenteritis, and other clinical conditions that limit the safety of castration. According to article 1 of law no. 13,426/2017, birth control for dogs and cats in Brazil must follow what is established in the law and in resolution no. 1596, which recommends permanent sterilization by surgery or another method that ensures the efficacy, safety, and well-being of the animal, in accordance with the principles of these laws (CFMV, 2017).

Of the eligible animals, 53.06% (n = 52) were canines and 46.94% (n = 42) were felines. This number corroborates with [Catapan et al., 2014](#), who demonstrated in their study a greater adherence of canines followed by felines, attended to in the neutering program in the municipality. In contrast, in the research by [Mendes & Ferreira \(2022\)](#) carried out in the municipality of Ananindeua - Pará, there was a higher prevalence of neutering for cats compared to dogs. The guidance to choose dogs over cats may be based on the more notable ease of communication between dogs and humans, an increased sense of protection and companionship that dog owners tend to perceive, reflecting a more significant social role and contribution to dogs. Furthermore, this is supported by reasons such as their usefulness in guarding and their ability to interact with children ([Dahás et al., 2013](#)), and semi-domiciled, stray, or feral cats are more difficult to capture, requiring trained staff ([David et al., 2023](#); [Pereira et al., 2020](#); [Sparkes et al., 2013](#)).

Regarding sex, in the canine species, there was greater adherence among females 92.3% (n = 48) of whom underwent OSH and 7.7% (n = 4) of whom underwent pre-scrotal orchiectomy. Of the total number of felines, 78.2% (n = 36) of whom underwent OSH and 21.8% (n = 10) of whom underwent scrotal orchiectomy. These numbers reinforce what is stated in the studies by ([Paula, 2010](#); [Vieira, 2008](#))

in the municipality of Cabaceiras - Paraíba, which demonstrated a greater predominance of sterilizations in females. Based on the data presented, it can be seen that approximately 85.7% of all animals treated were female, providing excellent results for population control of these species since castration of females is more effective since their sterilization is more efficient than that of males, due to the direct importance of these animals in generating new individuals, such as when they escape from home, preventing unwanted reproduction ([Braga & Ferreira, 2013](#)). As for male dogs, priority is given to those that are fierce and have an uncontrollable temperament, since castrated animals tend to be less aggressive and less prone to escapes, fights etc ([Braga & Ferreira, 2013](#); [Catapan et al., 2014, 2015](#); [Lui et al., 2011](#)).

During the campaign, interviews were conducted with 86 owners who had their animals neutered. When asked about their vaccination status, 62.1% responded that they vaccinated their animals, which is a positive result that shows that a considerable portion of the community is aware of the importance of this act. However, it was observed that most of them mentioned anti-rabies as the only vaccine administered. This may indicate a lack of awareness about the variety of vaccines available to protect pets against several serious diseases, such as leptospirosis and visceral leishmaniasis, which are zoonotic in nature. In addition, infectious diseases are possibly the leading cause of death in pets in Brazil, and every effort should be made to prevent them ([Bentubo et al., 2007](#); [Filgueira et al., 2008](#); [Vasconcelos, 2011](#)). According to the [Ministry of Health \(2022\)](#), 80% of rabies vaccination coverage is recommended for animals. When compared with the current study, it is noted that the animals treated during the sterilization action are below the national target. This fact may be linked to the lack of awareness regarding the importance of the risks that the disease represents, difficult access to veterinary services, and negligence.

Regarding deworming, 73% of respondents regularly deworm their pets, and only 38% of owners stated that they did not follow the deworming protocol, indicating the need to raise awareness about this important practice. These results differ from studies conducted by [Abreu & Vasconcelos \(2019\)](#), in which 28.6% stated that animals from Santa Cruz do Ariri, PA, that participated in the castration program were dewormed and 71.4% had outdated deworming protocols. This is a concern since deworming is essential to prevent the spread of intestinal parasites that can affect the health of the animals themselves and, potentially, be transmitted to humans.

The owners of the females were asked if there had been any pregnancy; 38.81% said yes; however, 61.19% denied it. Regarding the application of injectable contraceptive methods, 57.63% answered yes and 42.47% said no. This result corroborates the analyses carried out by [Abreu & Vasconcelos \(2019\)](#), in which it was pointed out that 70.6% of the females had already become pregnant and 19.04% had been administered contraceptives.

There is science that contraceptive methods are a hormone bomb that causes hormonal imbalance in the female organism when used inappropriately and without veterinary medical guidance. This drug is closely linked to several diseases, including pyometra, metritis, breast tumors, uterine, and ovarian tumors. In studies carried out by [Dias et al. \(2013\)](#) at the Veterinary Hospital of the University of Franca, of 100 animals treated, 13% used contraceptive drugs, 25% of which developed neoplasms, mainly mammary.

According to [Overley et al. \(2005\)](#), the efficacy of ovariosalpingohysterectomy (OSH) in preventing mammary neoplasms varies with the age at which the procedure is performed. If OSH is performed up to 6 months of age, the protection conferred against mammary neoplasms is 91%. When the procedure is performed between 7 and 12 months, the protection rate is 86%, and for animals aged between 13 and 24 months, the efficacy drops to 11%. Above this age range, no significant benefits were observed in the prevention of mammary neoplasms in cats.

According to studies by [Nelson & Couto \(2015\)](#) and [Jericó et al. \(2015\)](#), several studies have shown that administering a single dose of contraceptives to females can result in a series of adverse health changes, including the occurrence of mammary hyperplasia, the formation of tumors and cysts in the ovaries, as well as the development of pyometra, among other complications. This relationship was corroborated during the campaign in the municipality of Salinópolis, since these changes were observed in females that had previously received exogenous progestogens.

The high prevalence of pregnancy and the use of contraceptives can increase the risk of reproductive complications, as observed in our study (Figure 3), and according to ([Araújo et al., 2017](#); [Fernandes et al., 2020](#); [Silva et al., 2020](#)). By visually showing the potential consequences of not adequately controlling the reproduction of dogs and cats, they reinforce the importance of promoting responsible guardianship practices, such as surgical sterilization, to avoid these reproductive health problems. In addition, these images can serve as a valuable educational tool to raise awareness among owners about the associated risks, especially when contraceptives are used during unknown gestation ([Monteiro et al., 2009](#)). The adoption of robust public policies can boost animal protection and welfare programs, in addition to increasing the number of sterilizations to prevent the spread of contagious diseases, accidents, and mistreatment ([Tovo & Wilmsen, 2023](#)).

To calculate the projection of births avoided by the sterilization campaign in the municipality of Salinópolis, Pará, we can use the information provided by [Assunção \(2018\)](#) on the average pregnancy rates and puppies per pregnancy for female dogs and cats, together with the number of animals sterilized by the "Veterinarians in the Amazon" program. According to [Assunção \(2018\)](#), female dogs usually have approximately 2 pregnancies per year, resulting in an average of 6 live births. Female cats can have up to 4 litters per year, with an average of 4 live births per pregnancy. Based on these data, it is estimated that the sterilization campaign in the municipality of Salinópolis, PA, has prevented approximately 1,152 annual births of puppies, both canine and feline, of which 576 were cats and 576 were dogs, representing an impact of approximately 16.52% on the feline community and approximately 6.27% on the canine community, based on population estimates using the Junqueira method. Thus, the campaign had a significant effect on reducing the animal birth rate in the municipality.

According to [Junqueira \(2017\)](#), to estimate the dog and cat population in Brazil, he determined a human-animal ratio by state in Brazil. In Pará, the dog: human ratio was determined to be 1:4.43 and the cat: human ratio was determined to be 1:11.67. According to data from the [Brazilian Institute of Geography and Statistics \(2019\)](#), the population in the municipality of Salinópolis (PA) corresponded to 40,675 inhabitants. Therefore, it is estimated that approximately the dog population is 9,185 and 3,487 cats.

The results obtained in the present study in Salinópolis reveal a significant reduction in the animal population due to sterilizations when compared to other actions with the same purpose in different locations. Corroborating previous studies, which were successful in the number of births avoided, such as [Catapan et al. \(2014\)](#) in São José de Pinhais, Paraná, with 4,083, [Caldas \(2018\)](#) in Belém, Pará, with 2,288, [Abreu \(2019\)](#) in Santa Cruz do Arari, Pará, with 264, and [Mendes and Ferreira \(2022\)](#) in Ananindeua, PA, with 3,370.

According to [Molento et al. \(2005\)](#), the considerable increase in the number of animals can be attributed to several reasons, such as the displacement of families, the lack of solid foundations in the promotion of responsible guardianship in this social body, and a significant influx of animals, many of which are abandoned, coming from different locations. In detriment of this, this study demonstrates that the combination of sterilization programs and awareness about vaccination and deworming, together with the promotion of responsible guardianship, plays a fundamental role in reducing the overpopulation of dogs and cats, preventing zoonotic diseases, and promoting animal welfare. The continuation of these actions is crucial to maintaining the success in the population management of these animals in Salinópolis and other regions ([Tovo & Wilmsen, 2023](#)).

Controlling the stray animal population not only benefits animal welfare but also reduces the spread of zoonoses, alleviates animal suffering, and promotes more harmonious coexistence between humans and animals ([Tovo & Wilmsen, 2023](#)). This study not only reinforces the relevance of sterilization campaigns but also highlights the need for broader public policies, ongoing education, and community awareness to effectively address the challenges of dog and cat overpopulation.

Conclusion

In view of the growing challenge of dog and cat overpopulation in Brazil, this study demonstrated the effectiveness of surgical sterilization programs as a fundamental approach to population control of these animals, with a special focus on promoting One Health. The action in the municipality of

Salinópolis, Pará, provided valuable insight into how surgical sterilization combined with community education and awareness can be highly effective in reducing birth rates of these animals. With the commitment of individuals, organizations, and authorities, it is possible to promote a positive change in the reality of street animals, improve the quality of life of communities, and strengthen the concept of One Health in our country.

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Conflict of interest

The authors have no conflict of interest.

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