

Domestic animals in the Algodoal-Maiandeuá Environmental Protection Area in the state of Pará: actions for One Health

Animais domésticos na Área de Proteção Ambiental Algodoal - Maiandeuá no estado do Pará: ações para a Saúde Única

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ABSTRACT

Environmental protection areas suffer from human interventions such as introducing domestic animals (dogs and cats) without management or sanitary care, causing public health inconvenience and conserving natural ecosystems. This is especially the case when populations are established without any reproductive control, interfering in the daily interspecies relationships, which can cause ecosystem imbalances. Given this, the objective of this research was to carry out activities to promote One Health in the Sustainable Use Conservation Unit Algodoal-Maiandeuá Environmental Protection Area located in the municipality of Maracanã in the State of Pará, through actions that involved vaccination, deworming, and surgical sterilization of dogs and cats, as well as educational lectures on animal welfare, guardianship, crimes of abuse, and zoonoses. During the actions involving cats and dogs, 208 animals were vaccinated, 138 were dewormed, and 237 were sterilized. For this reason, it is crucial to sustain these actions by focusing on One Health aspects of native fauna conservation and the continuity of ecological processes on the island.

Keywords: One health. Conservation unit. Population control. Zoonoses. Human interventions.

RESUMO

Áreas de Proteção Ambiental sofrem com intervenções antrópicas como a inserção de animais domésticos (cães e gatos) sem qualquer manejo ou cuidado sanitário, ocasionando transtornos à saúde pública e a conservação dos ecossistemas naturais. Este é especialmente o caso quando as populações se estabelecem sem qualquer controle reprodutivo, interferindo no cotidiano das relações interespecies e podendo ocasionar o desequilíbrio do ecossistema. Diante disso, o objetivo desta pesquisa foi realizar atividades para promoção da Saúde Única na Unidade de Conservação de Uso Sustentável - Área de Proteção Ambiental Algodoal-Maiandeuá localizada no município de Maracanã no Estado do Pará, por meio de ações que envolveram vacinação, desparasitação e esterilização cirúrgica de cães e gatos, além de palestras educativas sobre bem-estar animal, guarda responsável, crime de maus tratos e zoonoses. Nas ações que envolveram cães e gatos, 208 animais foram vacinados, 138 foram vermifugados e 237 esterilizados. Por esta razão, é fundamental manter essas ações, focando os aspectos da Saúde Única, da conservação da fauna nativa e da continuidade dos processos ecológicos na ilha.

Palavras-chave: Saúde única. Unidade de conservação. Controle populacional. Zoonoses. Intervenções antrópicas.

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The negative impacts of dogs and domestic cats in various categories of human dependence (pets, free, and wildlife) are well known in protected and urban areas (Ramos-Rendón et al., 2023). When living free, these domestic animals impact the local native fauna through predation and transmission of pathogens and competition for food and territorial occupation. These activities cause behavioral changes that lead to a reduction of species in their natural habitat (Díaz et al., 2023; Doherty et al., 2016, 2017; Lepczyk et al., 2023; Loss et al., 2013; Ramos-Rendón et al., 2023).

According to Ziller & Zalba (2007) and Bento (2019), threats to biodiversity should be prevented, controlled, and eliminated. Additionally, the state of health of dogs and cats introduced in conservation units (UCs) is still little studied, and the potential impact of disease transmission between animal and human populations has thus become a significant concern (Brandão, 2020).

According to Ferreira (2022), pandemics such as the recent one caused by the coronavirus COVID-19 derive from initial transmission events between pathogens of wild animals and humans. Furthermore, according to Yeh et al. (2018), the One Health Concept depends on the interdependence of three pillars: humans, other animals, and complex socioecological systems, all of which influence the occurrence and transmission of infectious diseases.

Using biological samples (blood, secretions ocular, nasal, and genital) provided by the Amazon Veterinarians Project, Castro et al. (2022) made the first molecular detection of type 1 canine herpesvirus (CAHV-1) in dogs in the Amazon region, northern Brazil, with a particular focus on the island of Algodoal, with 61% (8/13) of the total of dogs diagnosed as positive. David et al. (2023),

in a preliminary survey on hemoparasites in dogs on the island of Algodoal, found the occurrence of *Ehrlichia canis* and *Anaplasma platys*. These two critical pathogens can affect the local fauna and illustrate the need for more work in diagnosing circulating infectious agents within the Algodoal-Maiandeuá environmental protection area.

Algodoal Island is located in the municipality of Maracanã, northeast of the state of Pará (Figure 1). It is designated as an Environmental Protection Area (APA Algodoal-Maiandeuá) (State Law No. 5,621, Nov. 27, 1990; Pará, 1990) in the category of Sustainable Use Conservation Unit (Instituto de Desenvolvimento Florestal e da Biodiversidade do Pará, 2019). The uncontrolled introduction and reproduction of dogs and cats on the island can lead to a severe public health problem and potentially promote a considerable loss of faunal biodiversity due to the transmission of pathogens, territory competition, and predation of native species. It is thus necessary to perform actions that aim to mitigate these problems efficiently, considering local and social particularities and thinking about the welfare of animals.

To foster the objectives exposed, activities were carried out to promote One Health on the island of Algodoal through anti-rabies vaccination, deworming, and surgical sterilization of dogs and cats, seeking population control and animal welfare. Educational lectures on guardianship, zoonoses, and current laws on mistreatment were also provided.

To estimate the number of animals present on the island, data obtained by David et al. (2023) were used, showing 353 dogs (303 semi/domiciled and 50 free-ranging dogs) and 114 cats (83 semi/domiciled and 31 free-living). Azevedo et al. (2019) estimated the population of dogs and cats in the village of Algodoal (300 animals) in 115 homes visited, where 100% of people interviewed claimed to have animals (78% dogs and 22% cats). Of these animals, 61% were semi-domiciled, and only 39% were domiciled. However, the authors did not specify the number of animals in terms of species (dog or cat) or even sex, so much of the information could not be analyzed.

During the activities, 138 animals (123 dogs and 15 cats) were vaccinated—the anti-rabies vaccination aimed to reduce the risk of this severe zoonosis. Furthermore, according to Heliodoro et al. (2020), non-domiciled domestic animals, such as free-ranging cats, can prey on bats, representing a risk to native fauna at different levels and a risk of the re-emergence of feline rabies. This situation may be aggravated on the island by the low number of vaccinated cats due to the difficulty owners have in capturing their animals for vaccination since most animals are semi-domiciled and do not accept containment by tutors.

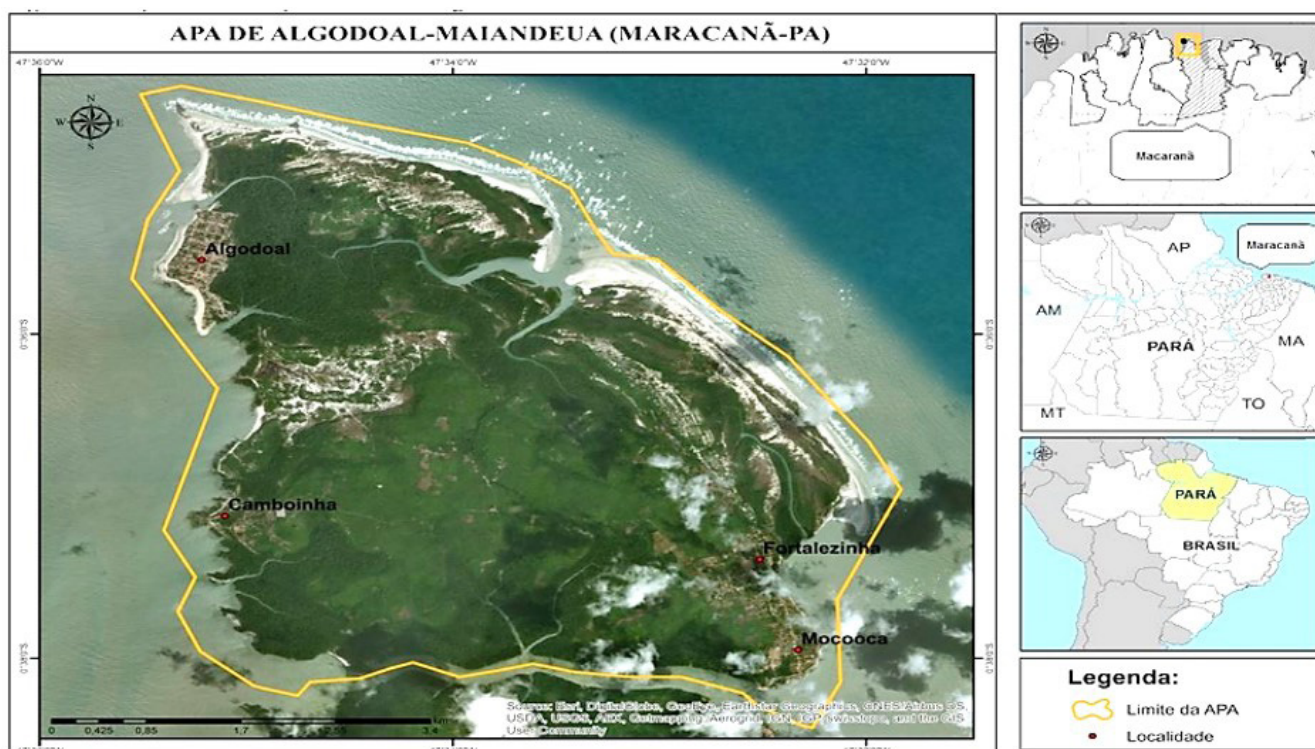


Figure 1 – The Algodual-Maiandeuá APA is located in the municipality of Maracanã in the State of Pará.
Source: Honda (2018).

Furthermore, cats are more independent of humans than dogs and have an even stronger prey drive, which makes them even more dangerous, both from a health perspective and for the conservation of native fauna, as their control is more complex (Coronel-Arellano et al., 2021; Lepczyk et al., 2023; Mendoza Roldan & Otranto, 2023).

For deworming the animals, Ivermectin 1% was used at a dose of 0.4 mg/kg subcutaneously and applied to 112 dogs (Figure 2) and 26 cats. Ivermectin was used because of its endo- and ectoparasitic properties. Oliveira (2017) observed ectoparasites, which are characteristic of domestic animals in the local fauna, indicating a parasitic exchange. Furthermore, several authors have highlighted the risk of transmission between pathogens in domestic, wild, and human animals (Costanzi et al., 2021; Martins et al., 2024; Mendoza Roldan & Otranto, 2023; Reis et al., 2023).

Mendoza Roldan & Otranto (2023) also noted the significant risk that dogs and cats' predation on wildlife poses to the transmission of zoonotic parasitic diseases caused by protozoa (toxoplasmosis, acute muscular sarcocystosis, cryptosporidiosis), cestodes (mesocestoidiosis, alveolar echinococcosis, coenusiosis, sparganosis), and nematodes (visceral and cutaneous larva migrans). Predation thus represents a potential risk to human health that stakeholders and public health authorities should address.

In this sense, observing the list of notifications from the municipality of Maracanã from 2008 to 2023 (Table 1), it was

Table 1 – List of complaints attended at the Family Health Unit of the Island of Algodual

Municipality of notification	Grievance	Number of cases
Maracanã	Anti-rabies treatments	70
Family Health Unit of Algodual Island	Accident due to venomous animal	1
	Tuberculosis	1
	AIDS	1
	Syphilis	1
	Interpersonal violence	1

Source: Brasil (2023).

found that 93% (n = 70) of the notifications of the Family Health Unit of the Island of Algodual involved anti-care rabies. This reveals a high incidence of animal incidents since the island has numerous semi-dominated and free-living animals wandering the streets, further highlighting the potential risk to public health.

In addition to the vaccination, deworming, and castration campaigns, educational lectures were given with the support of the Environment Police Station and Animal Defense (DEMAPA). These had an educational/participatory character (Figure 3) and dealt with animal welfare, responsible guardianship, zoonoses, and current legislation on mistreatment. Moreover, as observed by Caetano & Boeing (2019), disseminating the principles of animal welfare and responsible guardianship enables changes in the care of animals, thus improving their quality of life.



Figure 2 – A-D: Team veterinarians from the Amazon realized vaccinations and deworming dogs and cats in residences on Algodooal Island, Pará, Brazil. (A) arrival of the team at a local house; (B) vaccination of dogs in a public square at Algodooal; (C) vaccination of cats in a small station in the Algodooal village; (D) capture of free-ranging animals with the help of a fishing net for vaccination and antiparasitic application.

Source: David (2023).

For Smith et al. (2022), initiatives such as castration combined with responsible guardianship measures may be the most effective in reducing and controlling the animal population while improving welfare conditions. With that in mind, as a measure of population control on the island, four male and female castration actions were performed on animals aged 4 months to 6 years for 261 castrated animals (dogs and cats). As with other activities performed (vaccination and deworming), dog care was predominant at 79.7% ($n = 208$) over cats 20.3% ($n = 53$), similar to that observed by Bento (2019), who found that among the sterilized animals in his study, 65.9% were dogs and 44.4% were cats.

Whereas a bitch can have up to 10 puppies and a female cat up to 12 kittens in a year, by projecting, we can consider

that if the number of bitches corresponds to 64.9% of canines ($n = 135/208$) and that the number of female cats refers to 64% of cats ($n = 34/53$), approximately 1,350 dogs and 408 cats will cease to be born, totaling 1,758 animals, in the year following castration alone (Hadad, 2019 apud Jericó et al., 2015).

Although the goal achieved in the four castration actions was only 86% ($n = 261/303$) of the semi/domiciled animal population informed by the tutors, in the questionnaires, animals living free on the island were also served. These were vaccinated, dewormed, and castrated and were under the supervision of residents for postoperative care but were not included in current statistics due to the small number of animals served ($n = 17$ animals). According to Azevedo et al. (2019),



Figure 3 – A-D: Educational activities developed at Algodual Island focused on animal welfare, responsible guarding, zoonoses, and conservation. (A) lecture for High School Students at “Escola Municipal Maria de Lourdes Ferreira”; (B) exhibition of banners to raise awareness among the local population about animal abuse and conservation; (C) folder’s distribution about animal welfare and responsible guardianship for high school students; (D) informative banner on cutaneous larva migrans, an important zoonosis on the island.

Source: David (2023).

there is a lack of public policies aimed at the inhabitants of the island in order to provide them with guidance on proper care with their animals, as well as for the development of health and reproductive measures for these animals through deworming, vaccination, and castration campaigns. According to the authors, food demand has increased due to inadequate management, neglect, and abandonment of animals on the island, resulting in scarcity, competition between domestic and native animals, predation, and ecological imbalance.

The overpopulation of free-living animals (Figure 4) has become a global challenge that requires immediate solutions to manage its population, and surgical castration is one of the most common methods used for population control (Abdulkarim et al., 2021). However, the authors point out that to achieve successful control measures, it is necessary to establish a system of monitoring and management of the animal population with community participation, which must be informed about the potential problems that free-living domestic animals can cause.

According to Lepczyk et al. (2023), insular environments contain three times more animal species considered problematic in terms of conservation than continental environments, which makes it fundamental to understand the impacts of domestic animals on native fauna in these

complex ecological systems. As a result, the density of extinct and critically endangered species is much higher on the islands than on continents. On the islands, invasive species are the most cited cause of species extinction, indicating that managing invasive predators on islands must be a global conservation priority (Doherty et al., 2016; Tershy et al., 2015).

In this sense, the activities increased local community awareness of animal issues, provided clarity regarding animal welfare, responsible guardianship, abuse, immunization, and deworming issues, and showed the importance of these healthcare practices for the community (Figure 5). After this input, the community showed interest in controlling and improving the quality of life of the animal population, thus contributing to improving the quality of life of the human and animal populations on the island.

Given this, it is clear that the actions to promote One Health were highly beneficial, and it is strongly recommended that they be continued and improved. Furthermore, while actions were successful in dog control, they were not so efficient for cats, mainly because their capture and containment are much more challenging than for dogs.

In short, the results confirm that the control program has obtained favorable results but still needs to be better



Figure 4 – A-E: Dogs observed in various natural environments on the island. The “F” figure depicts the closeness between a child and a bitch with dermatologic problems.

Source: David (2023).

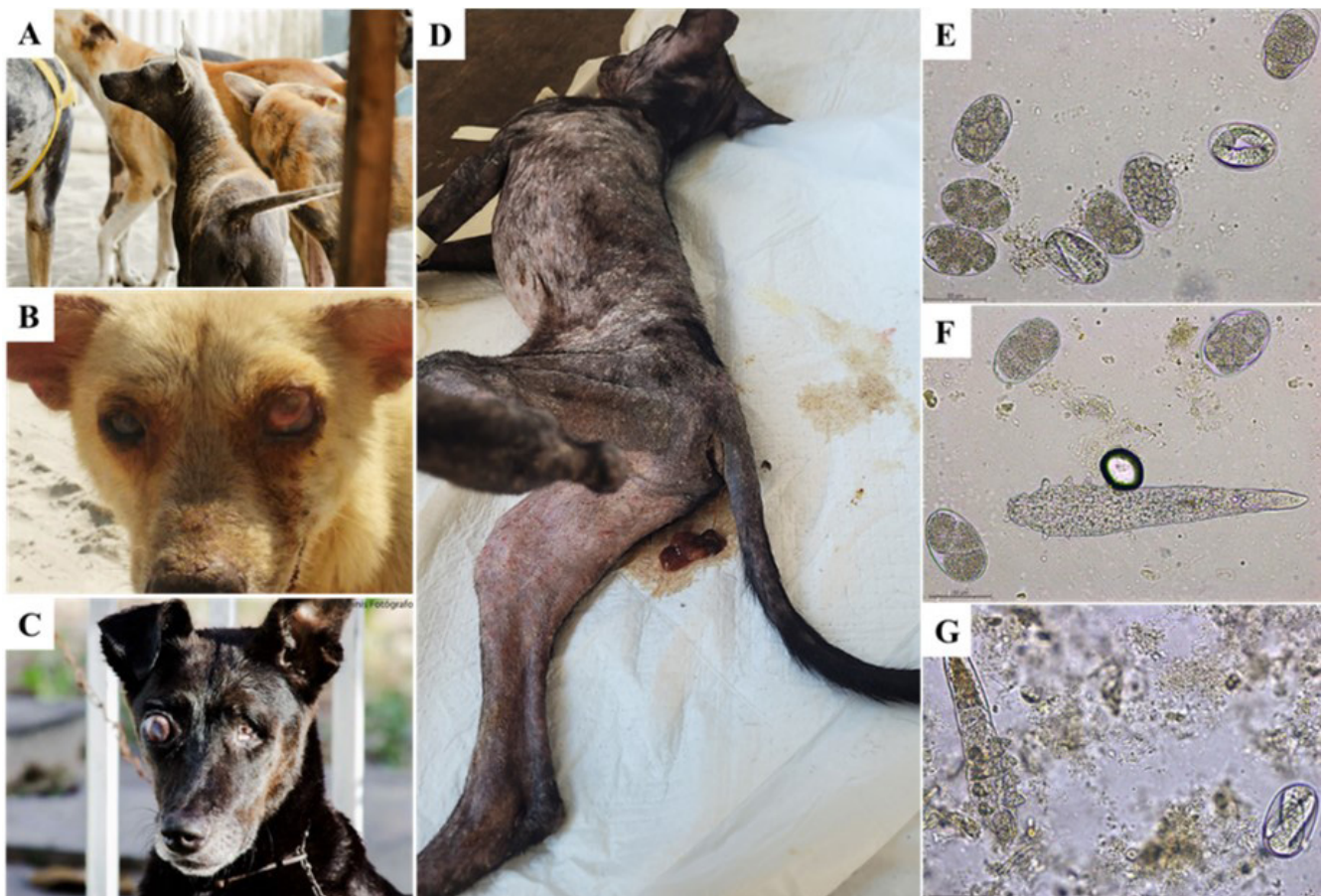


Figure 5 – A-G: Some health problems observed in animals on the island of Algodóal. (A) bitch with an extensive alopecic area on the skin with characteristics compatible with mange; (B) animal showing perforation of the eyeball; (C) dog presented exophthalmos on the right side and the absence of the left eye; (D) is a 6-month-old puppy with mucosanguinolent feces and alopecia throughout the body; (E) examination of the animal’s feces shows hookworm eggs’ presence at various stages of development; (F) and (G) hookworm eggs and *Demodex sp.* found in the animal’s feces confirm the animal’s clinical picture of demodectic mange and verminosis.

Source: David (2023).

evaluated from the point of view of both population control and the impacts of domestic animals on the island's native fauna. There is an evident need to develop other activities to promote One Health on the island, with greater participation by public agencies in collaboration with groups, such as "Amazon Veterinarians," who seek to contribute to the improvement of the quality of human and animal life and the environment in the northern region of Brazil.

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Conflict of Interest

We declare to have no conflict of interest in the publication of this work.

Ethics Statement

Ethics Committee on the Use of Animals (CEUA) No. 23084.010805 of the Federal Rural University of the Amazon and Ethics Committee on Research with Human Beings - CEP No. 6.830.970.

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