***Original Research Article***

**Survey of Ecto- and Gastrointestinal parasites of Wild Cane Rats (*Thryonomys swinderianus*) in Ifedore Local Government Area of Ondo State, Nigeria**

**Abstract**

**Background**

Wild cane rats (*Thryonomys swinderianus*) are highly susceptible to infestations by ectoparasites and gastrointestinal parasites, posing significant zoonotic and veterinary health risks. This study investigates the prevalence and intensity of ectoparasites and gastrointestinal parasites in wild cane rats across six communities in Ifedore Local Government Area, Ondo State, Nigeria.

**Methods**

This study was conducted from May 2020 to March 2021. A total of 60 cane rats were examined using standard parasitological techniques to identify ectoparasites and gastrointestinal parasites. Ectoparasites were collected, preserved in 70% ethanol, and identified using a stereomicroscope and taxonomic keys. Gastrointestinal parasites were recovered through necropsy, with faecal egg counts performed using the sedimentation technique. Data analysis was conducted using SPSS version 20, with statistical significance set at P < 0.05.

**Results**

The study recorded a 100% prevalence of *Ixodes* ticks across all study sites, with the ears (70%) and back (24.55%) being the most common attachment sites. Gastrointestinal parasites were found in 86.7% of cane rats, with no significant variation across locations (P > 0.05). Males had a significantly higher gastrointestinal parasite burden (P = 0.04) compared to females. The identified gastrointestinal parasites were nematodes, including *Ascaris* sp., *Trichuris* sp., and *Trichostrongylus* spp., with *Ascaris* sp. being the most prevalent. The large intestine had the highest parasite intensity (63.3%), differing from previous findings where the small intestine was most affected.

**Conclusion**

This study highlights the widespread occurrence of ectoparasites and gastrointestinal parasites in wild cane rats, emphasizing the need for regular monitoring and control measures. Given the potential zoonotic risks, strategies such as regular deworming, improved meat hygiene, and parasite surveillance are recommended to mitigate public health and veterinary concerns.

**Keywords:** Prevalence,Ectoparasites, Gastrointestinal, Intensity, Cane rats, Predilection site

**1. INTRODUCTION**

The cane rat (*Thryonomys swinderianus* Temminck, 1827), also known as the grasscutter, is a large rodent widely distributed across sub-Saharan Africa (Okorafor *et al.*, 2012; Opara, 2012). It thrives in various habitats, including grasslands, farmlands, and forest edges, where it primarily feeds on grasses and cultivated crops (Okorafor *et al*., 2012). This species holds significant economic importance as both an agricultural pest and a valuable source of bushmeat (Futagbi *et al.*, 2010). It also plays an important ecological role by influencing vegetation dynamics through its feeding. As herbivores, cane rats contribute to plant growth regulation, seed dispersal and serve as prey for larger predators maintaining ecosystem balance.

Despite its destructive tendencies on crops such as maize, sugarcane, cassava, and oil palm, cane rat meat remains highly sought after, providing an essential protein source for many communities in Central and West Africa (Kilwanila *et al.*, 2021) including in Nigeria. The demand for cane rats continues to grow due to its availability, affordability and preference over other meat sources in rural communities. The socio-economic factors driving cane rat hunting and consumption include poverty, high market demand for bushmeat, and its role as a livelihood source for hunters and traders. In Ondo State, traditional hunting remains a key practice, sustaining local economies and bushmeat markets. It is estimated that approximately 80 million cane rats are harvested annually, yielding nearly 300,000 metric tonnes of meat (Buba *et al*., 2022). The widespread consumption of cane rat meat, cutting across religious, gender, and ethnic lines, underscores its cultural and nutritional significance in many African societies (Amuzie *et al.*, 2022; Futagbi *et al*., 2010; Okorafor *et* *al*., 2012).

Beyond their economic and dietary relevance, cane rats are also of veterinary and public health importance due to their susceptibility to various parasitic infestations (Adejinmi & Emikpe, 2011; Amuzie *et al*., 2022; Buba *et al.*, 2022; Okorafor *et al*., 2012). They serve as hosts to a range of ectoparasites and gastrointestinal parasites, which can impact their health and pose potential zoonotic risks. Previous studies have identified parasitic infections such as *Trypanosoma* spp., *Plasmodium* spp., *Trichinella* spp., and *Babesia* spp. in cane rats. Additionally, *Trypanosoma congolense*, *T. vivax*, and *T. gambiense* have been detected in this species (Okeke *et al.*, 2013). Ectoparasites such as ticks and fleas not only cause irritation and anemia in infected animals but also serve as vectors for zoonotic diseases, including babesiosis, ehrlichiosis, tularemia, and Lyme disease (Okorafor *et al*., 2012). The presence of these ectoparasites (Mustapha *et al*., 2019; Okeke *et al*., 2013) and gastrointestinal parasites (Amuzie *et al*., 2022; Paul *et al*., 2016) in cane rats raises concerns about their potential role in disease transmission within both wild and domesticated animal populations.

Despite the growing recognition of cane rats as both economic assets and potential reservoirs of parasitic infections, there remains a significant gap in epidemiological data regarding their parasitic burdens across different ecological zones (Okeke *et al*., 2013). Prior studies have emphasized the need for continuous surveillance to assess parasite prevalence, intensity, and distribution in cane rat populations (Futagbi *et al.*, 2010). Understanding the dynamics of these parasitic infestations is crucial for developing appropriate control measures, particularly in regions where cane rat hunting and farming are common practices.

This study aims to investigate the prevalence and intensity of ectoparasites and gastrointestinal parasites in wild cane rats from six communities in Ifedore Local Government Area, Ondo State, Nigeria. By identifying key parasitic species and their distribution patterns, this research seeks to contribute valuable data that can inform disease management strategies and enhance the sustainable utilization of cane rats as a protein source.

**2. Methodology**

**2.1 Study Area**

This study was conducted in six communities (Ilara-Mokin, Igbara-Oke, Ibule-Soro, Ipogun, Isarun, and Mariwo) within the Ifedore Local Government Area of Ondo State, Nigeria (Figure 1). The area is characterized by a tropical climate with distinct wet and dry seasons, supporting a variety of vegetation types suitable for cane rat (*Thryonomys swinderianus*) habitation.

This study was conducted over a ten-month period from May 2020 to March 2021, covering both rainy and dry seasons to account for seasonal variations in parasite prevalence.

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**Figure 1: Map of Ifedore local government (Olamiju & Olujimi, 2011).**

**2.2 Sample Collection**

A total of 60 cane rats were selected for the study, with ten (10) rats randomly sampled from each of the six study locations. The sample size was determined based on feasibility, ethical considerations, and prior studies on rodent parasitology, ensuring that it was sufficient to detect variations in parasite prevalence across different locations (Buba *et al*., 2022). The six study sites were selected due to their proximity to human settlements, agricultural activities, and known cane rat populations, allowing for a representative sampling of the region.

Wild cane rats were captured using locally made wire-mesh live traps baited with cassava or maize. Traps were set in the evening and checked early the following morning to minimize stress to the animals. Captured cane rats were transported to the Department of Biology, Federal University of Technology, Akure, Research laboratory in well-ventilated cages for examination.

**2.3 Survey of Parasites**

**2.3.1 Ectoparasite Survey**

Upon arrival at the laboratory, each cane rat was anesthetized using a cotton wool pad soaked with chloroform in a closed chamber for a brief period (approximately 2–3 minutes) until sedation was achieved. The animal was then carefully removed, and its fur was systematically examined by parting the hair and using a fine-toothed comb to locate ectoparasites. Forceps were used to detach ticks. Collected ectoparasites were preserved in 70% ethanol for subsequent identification. stored in labelled screw-lid containers and preserved prior to identification. Relevant data, including the date, location and predilection site, were recorded.

Preserved ticks were identified in the Department of Biology laboratory using a stereomicroscope and standard taxonomic keys provided by (Walker *et al*., 2003). Identification was based on morphological features such as tick length (measured with a calibrated ruler under the stereomicroscope), presence or absence of eyes, mouthpart length (long or short), scutum size (small or large), scutum coloration (ornate or inornate), body shape, and engorgement status (noting ticks swollen with blood).

**2.3.2 Gastrointestinal Parasite Survey**

Following the ectoparasite examination, cane rats were humanely euthanized following ethical guidelines provided by the Department of Biology. The gastrointestinal tract was dissected, and contents and parasites were isolated. Parasites were isolated, fixed in 70% ethanol, and identified morphologically using standard keys of Bowman (2014).

**2.4. Data Analysis**

The data obtained from the survey was entered into Microsoft Excel 2010 and transferred to Statistical Package for Social Sciences (SPSS version 20) for statistical analysis. Prevalence was calculated as the percentage of infected hosts among the examined population. Mean intensity was determined by dividing the total number of a specific parasite by the number of infected hosts. Statistical analyses were performed using appropriate software to assess the significance of differences in infection rates between variables such as sex, and location.

**3. Results**

**3.1 Prevalence of Infection in Cane Rats from Ifedore Local Government Area**

A total of 60 cane rats were examined across six communities, with 100% ectoparasite infestation and an overall gastrointestinal parasite prevalence of 86.7% (Figure 2). All cane rats from Ilara-Mokin and Mariwo were infected with at least one type of gastrointestinal parasite, while infection rates in other communities ranged between 80% and 100%. However, no statistically significant differences were observed in gastrointestinal parasite prevalence across the study locations (χ² = 2.308, df = 5, P = 0.805).

**Figure 2: Prevalence of Ectoparasites and Gastrointestinal Parasites in Cane Rats Across Study Sites**

This figure shows the percentage of cane rats infected with *Ixodes* ticks (ectoparasites) and gastrointestinal parasites across the six study locations in Ifedore Local Government Area, Ondo State, Nigeria.

**3.2 Ectoparasite Infestation in Cane Rats**

*Ixodes* ticks were the only ectoparasites recovered, showing 100% prevalence across all study sites. A total of 444 *Ixodes* ticks were collected from the examined cane rats. The distribution of ticks varied across locations, with Ilara-Mokin recording 52 ticks (11.71%), Igbara-Oke 48 ticks (10.81%), Ibule-Soro 80 ticks (18.01%), Isarun 106 ticks (23.87%), Ipogun 76 ticks (17.12%), and Mariwo 82 ticks (18.47%) (Figure 3).

The ears had the highest tick burden (70%), followed by the abdomen (63.3%), head (60%), neck (60%), tail (40%), and legs (46.7%) (Table 1). Tick infestation was observed in both male and female cane rats, with females exhibiting a slightly higher mean tick intensity (7.88 ± 0.79) compared to males (6.77 ± 0.80) (Table 2). However, this difference was not statistically significant (χ² = 4.03, df = 1, P = 0.04).

**Figure 3: Distribution of *Ixodes* Ticks Among Cane Rats Across Study Sites**

This figure illustrates the total number of *Ixodes* ticks collected from cane rats at each study location, highlighting variations in tick burden among different sites.

**3.3 Gastrointestinal Parasite Prevalence and Intensity**

Gastrointestinal parasites were highly prevalent, with *Ascaris sp*. (21.59%) and *Trichuris sp*. (18.36%) being the dominant nematodes recovered, followed by *Trichostrongylus spp*. (4.96%) (Figure 4).

Male cane rats exhibited a higher prevalence (100%) and mean intensity (7.69 ± 0.63) of gastrointestinal parasites compared to females (75%, 6.75 ± 0.83, respectively) (Table 2).

**Table 1: Prevalence and Mean Intensity of Ixodes Ticks Based on Predilection Sites on the body of cane rats Sampled**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Predilection Site** | **Number Examined** | **Number Infected (%)** | **Number of Ticks collected Infected (%)** | **Mean Intensity** | **χ2** | **Df** | **P-value** |
| **Head** | 60 | 60 (100) | 76 (17.12) | 1.27±0.08 | 144.00 | 6 | 0.00 |
| **Ear** | 60 | 60 (100) | 98 (22.07) | 1.63±0.11 |  |  |  |
| **Neck** | 60 | 54 (90) | 54 (12.16) | 0.90±0.04 |  |  |  |
| **Abdomen** | 60 | 38(63.30) | 38 (8.56) | 0.63±0.06 |  |  |  |
| **Leg** | 60 | 28 (46.67) | 45 (10.14) | 0.75±0.056 |  |  |  |
| **Tail** | 60 | 24 (100) | 24 (5.41) | 0.40±0.064 |  |  |  |
| **Back** | 60 | 60 (100) | 109 (24.55) | 1.82±0.11 |  |  |  |

This table summarizes the distribution of *Ixodes* ticks on different body parts of cane rats, showing the number of hosts examined, percentage infected, total tick counts, mean intensity, and statistical significance of infestation differences across predilection sites.

**Table 2: Overall Prevalence of Ecto- and Gastrointestinal Parasites Between Male and Female Cane Rats across the Study Sites.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Sex**  | **Number examined** | **Number Infected (%)** | **Intensity** | **Mean Intensity** |
| **Ectoparasites** | **Male** | 26 | 26 (100) | 88 | 6.77±0.80  |
| **Female** | 34 | 34 (100) | 134 | 7.88±0.79 |
| **Gastrointestinal Parasites** | **Male** | 26 | 26 (100) | 227 | 7.27±0.40 |
| **Female** | 34 | 24 (70.59) | 135 | 6.65±0.44 |

This table compares the prevalence and mean intensity of *Ixodes* tick infestation and gastrointestinal parasite infections between male and female cane rats, indicating sex-based differences in parasite burdens.

**Figure 4: Distribution of Gastrointestinal Parasites Among Cane Rats Across Study Sites**

This figure presents the prevalence of different gastrointestinal parasite species (*Ascaris* sp., *Trichuris* sp., and *Trichostrongylus* spp.) among cane rats in the study area.

**4. Discussion**

This study provides insights into the prevalence and distribution of ectoparasites and gastrointestinal parasites among wild cane rats (*Thryonomys swinderianus*) in Ifedore Local Government Area, Ondo State, Nigeria. The 100% prevalence of *Ixodes* ticks across all study sites confirms widespread infestation, aligning with previous reports (Mustapha *et al*., 2019; Okorafor *et al*., 2012). The variation in tick intensity across sites suggests that environmental factors such as humidity, temperature, and vegetation may influence parasite distribution (Futagbi *et al*., 2010).

The ears and back were the most common tick attachment sites, consistent with earlier findings (Mustapha *et al*., 2019; Okeke *et al*., 2013). These regions likely offer softer skin, increased blood flow, and protection from host grooming, reinforcing *Ixodes* ticks’ adaptive feeding strategies and the need for targeted ectoparasite management.

The high gastrointestinal parasite prevalence (86.7%) supports previous studies in Nigeria (Adejinmi & Emikpe, 2011; Amuzie *et al*., 2022; Futagbi *et al*., 2010), which reported the presence of *Oesophagostomum venulosum*, *Strongylus* sp., *Ascaris* sp., and *Strongyloides* sp. in cane rats. The lack of significant variation across study sites suggests that factors beyond the environment, such as dietary exposure, host immunity, and parasite transmission dynamics, may influence infection rates.

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Male cane rats had higher gastrointestinal parasite burdens than females, differing from some studies where females had greater infections (Amuzie *et al*., 2022; Elizabeth *et al*., 2022; Futagbi *et al*., 2010; Okorafor *et al*., 2012) This may be due to larger home ranges and increased exposure to contaminated environments in males. Additionally, testosterone-related immune suppression and stress from aggressive behavior may make males more susceptible to infections (Buba *et al*., 2022; Faustin *et al*., 2015). These differences highlight the role of host diet, parasite adaptation, and ecological factors in parasite distribution.

Only nematode worms, including *Ascaris* sp., *Trichuris* sp., and *Trichostrongylus* spp., were identified. The high prevalence of *Ascaris* sp. contrasts with findings by (Amuzie *et al*., 2022), who did not detect *Ascaris* sp. in domesticated cane rats. This suggests that improved hygiene in captivity may reduce transmission. The large intestine had the highest parasite intensity, unlike previous studies where the small intestine was most affected (Futagbi *et al*., 2010; Okorafor *et al*., 2012). These differences highlight the role of host diet, parasite adaptation, and ecological factors in parasite distribution.

This study emphasizes the need for continued surveillance and control measures to mitigate health risks associated with parasitic infections in cane rats.

**5. Conclusion and Recommendations**

**5.1 Conclusion**

This study enhances existing knowledge on parasitic infestations in wild cane rats and underscores the necessity of continued surveillance and control measures. Understanding the geographical dynamics of infestations is vital for developing effective control strategies and mitigating the zoonotic and veterinary risks associated with parasitic infections. Future research should focus on seasonal variations, host immune responses, and ecological determinants of parasite prevalence to inform more targeted intervention strategies.

**5.2 Recommendations**

The findings of this study have significant public health and veterinary implications, particularly in regions where cane rats are hunted and consumed as bushmeat. The high prevalence of parasites raises zoonotic concerns, as cane rats may act as reservoirs for parasites transmissible to humans and domestic animals. To reduce these risks, the following control strategies are recommended:

* Regular deworming and ectoparasite control programs in areas where cane rats are frequently hunted.
* Proper meat handling and hygiene practices to minimize the risk of gastrointestinal parasite transmission.
* Ongoing surveillance and monitoring of cane rat populations to track parasite dynamics and assess potential health threats.

Implementing these measures will help mitigate the public health risks associated with parasitic infections in cane rats while contributing to better disease management and control.

**Consent**

Not applicable.

**Ethical Approval**

The Department of Biology (BIO), Federal University of Technology, Akure determined that no formal ethics approval was required for this study.

**Disclaimer (Artificial intelligence)**

Author(s) hereby declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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