

## Prevalence of Gastrointestinal Parasites of Cane Rat (*Thryonomys Gregorianus*) during Rainy Reason in Gyawana Ecosystem, Adamawa State, Nigeria

Buba, Z. M., Emmanuel, H., Elihu, A. Joseph, J.

Department of Zoology, Adamawa State University, Mubi

Contact: [hunira12345@gmail.com](mailto:hunira12345@gmail.com); +2347034319643, +2348081914467

(Received in September 2022; Accepted in Decemember 2022)

### Abstract

Study on the prevalence of gastrointestinal parasites of cane rat (*Thryonomys gregorianus*) was carried out during rainy season to determine and compare the prevalence of gastrointestinal parasites according to sex. A total of sixty (60) cane rats (*T. gregorianus*) comprising of thirty (30) males and thirty (30) females were trapped from Gyawana ecosystem (sugar cane farm) using mouse glue trap. The cane rats (*T. gregorianus*) were sacrificed with chloroform, dissected and the gastrointestinal tract were removed and taken to Zoology department laboratory Adamawa State University Mubi for microscopy examination. Direct smear method for faecal examination was performed and stool specimen was processed following a formal-ether standing operation procedure. The gastrointestinal parasites were identified using standard keys. Frequencies and percentages were used to compare the percentage of various gastrointestinal parasites Paired T-test was also used to test for the differences by gender at  $P < 0.05$ . The result reveals seven (7) different species of gastrointestinal parasites (*Giardia* species, *Ascaris* species, *Strongyloides* species, *Coccidia* species, *Ancylostoma* species, Entamoeba species and *Trichuris* species). *Ascaris* species has the highest prevalence of gastrointestinal parasites with 19(28.8%), followed by *Ancylostoma* species 13(19.7%), *Giardia* species 12(18.2%), Entamoeba species 11(16.7%), *Strongyloides* species 7(10.6%), with both *Trichuris* species and *Coccidia* species having the least 2(3.0%) prevalence. Out of thirty (30) of each sex of cane rats (*T. gregorianus*), seventeen 17(56.7%) male and twenty-one 21(70.0%) females were infected by different gastrointestinal parasite. There was significant difference between male and female cane rat (*T. gregorianus*) at  $P < 0.05$ .

**Keywords:** Direct smear, Cane rat, Gastrointestinal Parasites, Gyawana Ecosystem, Sacrificed

### Introduction

Cane rat (*Thryonomys gregorianus*) is in a genus of the order Rodentia found throughout Africa south of the Sahara, the only members of the family *Thryomyidae*. They are eaten in some African countries and are pest species on many crops (Woods and Kilpatrick 2005). The cane rat (*T. gregorianus*), is a wild, herbivorous, hystricomorphic rodent, reputed for its tasty and high-quality meat. In the West African sub-region, it is a potential food source providing high quality protein for both urban and rural populations (Addo *et al.*, 2007). Consequently, cane rats are now being domesticated and captive-reared in parts of West Africa where they are sometimes referred to as micro livestock (Karikari and Nyameasem, 2009).

The cane rat (*T. gregorianus*) lives by reed-beds and riverbanks in Sub-Saharan Africa and is the smaller of the two extinct species in the genus *Thryonomys*. Lesser cane rat body measurements are: average head to tail length 380 mm; average tail length 90 mm; and average hind foot length 59 mm. Body mass can range from 2.65 to 7.5 kg. *Thryonomys* species are covered with bristle-like hairs that grow in groups of five or six, and lay longitudinally along their bodies. They lack underfur. Typical body coloration is speckled grayish brown or yellowish brown on the back and flanks, with grey or whitish under parts. The tail is sparsely covered with short bristle-like hairs and is brownish above and whitish underneath. Ears are short, rounded and hardly extend beyond the body pelage (Van der Merwe, 2007; Dawey *et al.*, 2022). Grasses eaten include Couch Grass (*Cynodon*

*dactylon*), Swamp Grass (*Hemarthria altissima*), Elephant Grass (*Pennisetum purpureum*) and Guinea Grass (*Panicum maximum*). While grasses are their principal food, they raid crops (such as maize, millet, sorghum, wheat, and sugar cane) and cause damage by cutting the stems at their base with their broad sharp incisors (Skinner and Chimimba, 2005).

*T. gregorianus* is typically found within reed beds or in areas of dense, tall grass with thick reed or cane-like stems, typical of riverine and other similar habitats. For example, in the Free State Province, it is associated with reed beds and dense grass around rivers, streams and pans, as well as irrigation dams, some water canals and mine dams (Van der Merwe and Avenant, 2004). It also uses thatching grass, which is of a similar reed-like structure. It is seldom found far from water and tends to inhabit the warmer areas of South Africa, although it has adapted to the winters of the Highveld (Van der Merwe and Avenant, 2004). Skinner and Chimimba, (2005) note that agricultural crops (such as maize, wheat and sugar cane) have greatly improved the habitat for this species, such that it has become an agricultural pest in some regions

## Materials and Methods

### Description of the study area

The study was carried out in Gyawana Ecosystem of Lamurde Local Government Area of Adamawa

### Sampling techniques

The study was conducted for a period of three (3) months (June to August 2022). Cane rat (*T. gregorianus*) were collected fortnightly from sugar cane farms in Gyawana ecosystem, Lamurde Local Government Area of Adamawa State, Nigeria. A total of sixty (60) adult male and female rats (*T. gregorianus*) were collected making a sub total of twenty (20) per month from cultivated areas (sugar cane) near streams and rivers. Thirty (30) of each sex of *T. gregorianus* were trapped using mouse glue trap from the study area as described by ((Iyanda and Adeomi, 2013; Buba *et al.*, 2018).

### Laboratory analysis

The following methods were used to carryout laboratory analysis:

### Macroscopic examination

State, Nigeria. Gyawana is located at latitude 9° .35' N and longitude 11° .55' E and is 35meters above sea level. Lamurde Local Government Area lies between longitude 9° .36' 03° .92' N and latitude 11° .47' 36° .25' E at an elevation of 137 meters above the sea level and has a population of 77,522 people (Adebayo *et al.*, 2012). Adamawa State is located in the North Eastern part of Nigeria, and lies between latitudes 7° and 11° N and between longitudes 11° and 14° E. It is on an altitude of 185 meters above sea level and covers a land area of about 39,741 km<sup>2</sup>. The State shares boundaries with Taraba State in the south and west, Gombe State in the northwest, Borno State in the north and an international boundary with the Republic of Cameroon along its eastern border, The Benue River, which transects the State, rises from the highland of Cameroon and flows southwards to join the River Niger at Lokoja in Nigeria. Two seasons are obtainable in the State, the wet (rainy) and dry seasons. The month of May to October constitute the wet season, during which no place receives less than 600mm of rainfall. The month of November to April constitute the dry season, during which the dry wind (harmattan) period is experienced between the month of November and February. The month of March and April are the hottest with an average temperature of 42°C, while November, December and January are the coolest months with an average temperature of 11°C (Adebayo *et al.*, 2020).

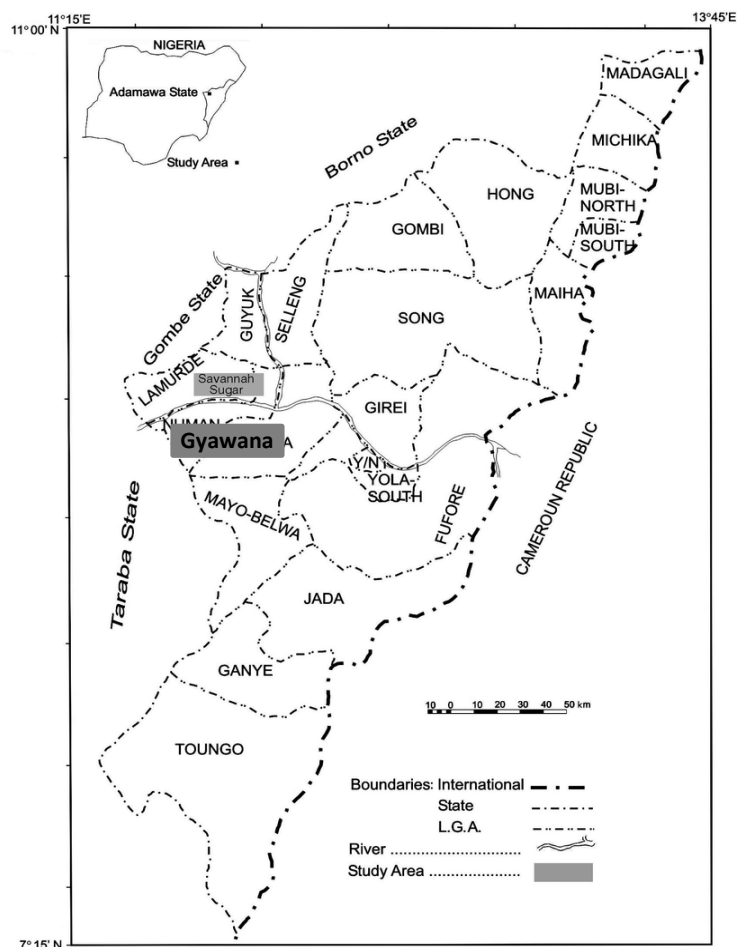
Following the method of Cheesbrough, (1987), a portion of faecal specimen of *T. gregorianus* was placed on a clean glass slide and examined macroscopically for colour consistency and constituents and the result was recorded based on gender.

### Formol-ether concentration method

Following the procedure of Arcari *et al.* (2000), stool specimen was processed following a formol-ether standing operation procedure. 1g of faecal sample was transferred into a clean centrifuge tube containing 7 ml of 10 percent formalin solution and mix thoroughly using vortex mixer. The suspension was filtered through a one millimetre (1 mm) sieve into a 15 ml centrifuge tube. Then 4 ml of diethyl ether was added to the formalin solution. The content was centrifuged at 3000 rpm for 1 minute. The supernatant was discarded and smear was prepared using a slide from the sediment.

Finally, the slide was examined under a microscope with magnification power of 10x and 40x objective lens for the presence of gastrointestinal parasite.

The gastrointestinal parasites recovered were identified on the basis of morphological characteristics as in (Arcari *et al.*, 2000).



**Figure 1:** Map of Adamawa State, Nigeria, showing the location of the study area Savannah Sugar Company - Gyawana Lamurde LGA

**Microscopic examination**

The stool sample smears were each observed using direct microscopy and formal ether concentration techniques. The two methods were used to minimize failure (negative result). On the other hand, formal ether concentration technique that is sensitive to even low infection was used for the bioassay as recommended by Cheesbrough, (1987).

**Direct microscopy technique**

Direct smear method for faecal examination was performed. Using glass rod, 1-2 grams of the faecal sample was placed on a clean grease free slide. A drop of the normal saline was added onto the sample, emulsified and debris removed. The smears were then each covered with coverslip cautiously and gently avoiding air bubble and over

flow of the sample. The smear was mounted onto a phase contrast microscope and examined under 10x and 40x objectives. The gastrointestinal parasite eggs were identified on the basis of their morphological characteristics according to method of (Arcari *et al.*, 2000).

**Statistical Analysis**

Analysis of variance (ANOVA) was used to test for the prevalence of gastrointestinal parasites recovered from *T. gregorianus*. The student T. test was also used to compare the prevalence of the gastrointestinal parasite of *T. gregorianus* by gender, using Statistical Package Software (SPSS for windows). The results were presented as prevalence of the infection with P<0.05 used as the level of the significant test.

**RESULTS**

The findings of this study revealed that seven (7) species of gastrointestinal parasites which consist of *Ascaris* species having the highest prevalence of gastrointestinal parasites with 19(28.8%) followed by *Ancylostoma* species 13(19.7%), *Giardia*

species 12(18.2%), *Entamoeba* species 11(16.7%), *Strongyloides* species 7(10.6%) with both *Trichuris* species and *Coccidia* having the least 2(3.0%) prevalence were found in the gastrointestinal of *T. gregorianus* and were presented in Table 1 and 2.

**Table 1:** Prevalence of gastrointestinal Parasites of *T. gregorianus* in Gyawana Ecosystem

S/No	Species of parasites	Male frequency (percentage)	Female frequency (percentage)	Total frequency
1	<i>Girdia</i> species	3 (25.0%)	9 (75.0%)	12
2	<i>Ascaris</i> species	5 (26.3%)	14 (73.7%)	19
3	<i>Strongyloides</i> species	2 (28.6%)	5 (71.4%)	7
4	<i>Coccidia</i> species	0	2 (100.0%)	2
5	<i>Ancylostoma</i> species	4 (30.8%)	9 (69.2%)	13
6	<i>Entamoeba</i> species	3 (27.3%)	8 (72.7%)	11
7	<i>Trichuris</i> species	0	2 (100%)	2

**Table 2:** The Prevalence of gastrointestinal Parasites of *T. gregorianus* by Gender in Gyawana Ecosystem

Sex	No. examined	No. infected	No. uninfected	% infected
Male	30	17	13	56.7%
Female	30	21	11	70.0%
Total	60	36	24	60.0%

The result of the prevalence of gastrointestinal parasites of cane rats (*T. gregorianus*) by gender in Gyawana ecosystem, Adamawa State, revealed that, 36(60.0%) of the cane rats were infected with several species of parasite. The females have high prevalence of gastrointestinal parasites with 21(70.0%), compare with males with 17(56.7%) prevalence of gastrointestinal parasites. Nevertheless, there was significant difference between gender and gastrointestinal infection at (P<0.05)

**Discussion**

The finding of this research work shows that there was seven different species, (*Girdia* species, *Ascaris* species, *Strongyloides* species, *Entamoeba* species *Coccidia*, *Ancylostoma* specie, *Trichuris* species) of gastrointestinal parasites observed in both male and female cane rat (*T. gregorianus*), 60.0% of the *T. gregorianus* were infected. The females have higher rate of infection with 70.0%, compared to the males with 56.7%. The finding also shows that *Ascaris* species having the highest prevalence of gastrointestinal parasites with 19(28.8%) followed by *Ancylostoma* species 13(19.7%), *Giardia* species 12(18.2%), *Entamoeba* species 11(16.7%), *Strongyloides* species 7(10.6%)

with both *Trichuris* species and *Coccidia* having the least 2(3.0%) prevalence were found in the gastrointestinal of *T. gregorianus*. The result of this study agrees with previous studies carried out in Ekumfi central region of Ghana (Ofori, 1999; Yeboah and Simpson, 2004), who identified *Trichuris* species., *Ancylostoma* species. and *Giardia* species., were among intestinal parasites reported in the cane rat. These parasites can be transmitted to their younger ones and other mammals, including humans who may come into contact with them.

The result of this study also correspond with the findings of (Opara and Fagbemi, 2008), who carried out research on the Gastrointestinal Helminth parasites of the wild grasscutter (*Thryonomys swinderianus*, *Temminck*) in Imo State, Nigeria, where *Ascaris* sp. and *Schistosoma haematobium* have high prevalence rate. And in this present study *Ascaris* species has the highest prevalence rate. There was no *Schistosoma haematobium* observed in this present study but present in the study carried out by Opara and Fagbemi, 2008. The differences in parasite diversity may be due to the geographical location or the species of the rat studied and it may also be

due to the season of the research work. The finding of this study was similar to those observed in the study conducted by (Futagbi *et al.* 2010 and Okorafor, *et al.*, 2012), on intestinal parasites of cane rats (*T. gregorianus*) from Kwaebibirem District of the Eastern Region of Ghana and also Oyo State, South-Western Nigeria respectively, where they observed several species of parasite found in gastro intestine of cane rat in their studies.

The study also revealed that 60.0% of cane rat (*T. gregorianus*) were infected with different species of parasite in the rainy season, which coincided with the result of Ivoke (2009), who found out that infections of gastrointestinal parasites in Nsukka, Nigeria were higher during the rainy season considerable of precipitation with a pooled prevalence of 60.0% in rainy.

### Conclusion

The study on the prevalence of gastrointestinal parasite of cane rat (*T. gregorianus*) in Gyawana ecosystem, the result reveals that multiple infections are common in the gastrointestinal of cane rat (*T. gregorianus*). Among the parasites found are in this order of prevalence: *Ascaris* species>*Ancylostoma*>*Entamoeba* species>*Girdia* species> *Strongyloides* species>*Coccidia* >*Trichuris* species. The female has higher prevalence rate of infection than the male cane rat (*T. gregorianus*).

### Recommendations

Base on the findings of this research work, the researchers thus recommend that, consumption of cane rat (*T. gregorianus*) as bush meat should be minimized and well screened for possible parasites before consumption to avoid further transmission of these parasites to human, the organisms should be handled with care and cooked thoroughly before consumption so as to minimize pollution of the farm with parasitic cysts and ova that are of zoonotic important. Further study should be carried out on the gastrointestinal parasites of *T. gregorianus* during dry season, in Gyawana ecosystem.

### References

Addo, P. G., Awumbila, B., Awotwi, E. and Ankrah, N. A. (2007). Reproductive characteristics of the female grasscutter (*Thryonomys gregorianus*) and

formulation of colony breeding strategies. *Livest. Res. Rur. Dev.*, 19 (4): 59.

Adebayo, A. A., Onu, J.I., Adebayo, E.F. and Anyanwu, S.O. (2012). Farmer's Awareness, Vulnerability and Adoption to Climate Change in Adamawa State, Nigeria. *British Journal of Arts and SocialScience*, 9(2): 106- 115.

Adebayo, A. A., Tukur, A. L. and Zemba, A. A. (2020). *Adamawa State in Maps*. Second edition, Paraclete Publishers, Yola-Nigeria, pp 6 – 45.

Arcari, M. Baxendine, A. and Bennet, C.E. (2000). *Diagnosing Medical Parasite through Coptological Technique*. 2 ([www.Soton.ac.uk/./vol2.htm](http://www.Soton.ac.uk/./vol2.htm))

Buba, Z.M., Yusufu, S.D., Akan, J.C. (2018). Determination of Some Heavy Metals Concentration in the Blood, Brain, Flesh and Liver of Cane rats (*Thryonomys gregorianus*) in Gyawana Ecosystem, Adamawa State, Nigeria. *International Journal of Pure and Applied Science* 5(1)38- 53

Cheesbrough, M. (1987). *Medical Laboratory Manual for Tropical Countries*. 2nd Edition, Butherwort, Great Britain. 321 – 341.

Dewey, T. A., Myers, P., Espinosa, R., Parr, C. S., Jones, T. and Hammond, G. S. (2022). *The Animal Diversity Web* (online). [www.animaldiversity.com](http://www.animaldiversity.com)

Futagbi, G., Agyei, D.O., Aboagye, I.F., Yirenya-Tawiah, D.R. and Edoh, D.A. (2010). Intestinal Parasites of the Grasscutter (*Thryonomys swinderianus* Temminck 1827) from the Kwaebibirem District of the Eastern Region of Ghana *West African Journal of Applied Ecology*, vol. 17: 83-86

Ivoke, N. (2009). Studies on the Seasonal Variations and Prevalence of Helminth Fauna of the Black Rat, *Rattus rattus* (L) (Rodentia: Muridae) from Different Microhabitats in Nsukka, Nigeria. *Animal Research International*, 6(3): 1063 – 1071.

Iyanda, A and O. Adeomi. (2013). Assessment of oxidative stress status and select heavy metal levels in serum of rats fed on cooked phosphide – powder residue contained cowpea. *Journal of Medical Science*. 2(1) 55 - 59

- Karikari, P.K. and Nyameasem, J.K. (2009). Productive Performance and Carcass Characteristics of Captive Grasscutters. *World Applied Sciences Journal* 6 (4): 557-563.
- Ofori Y. C. (1999). *Comparative study of the ecto and endo parasites of domesticated and wild grasscutters*. (BSc. Dissertation.) Department of Zoology, University of Ghana, Ghana. 50-59
- Okorafor KA, Okete JA, Andem AB, Eleng IE. (2012) Assessment of grasscutters' (*Thryonomys gregorianus*) sellers and hunter's conservation knowledge, rate of hunting and methods of hunting in Oyo State, Nigeria. *Eur J Zool Res.* 1:86-92
- Opara, M. N. and Fagbemi, B. O. (2008). Observations on the Gastrointestinal Helminth parasites of the wild Grasscutter (*Thryonomys gregorianus*, Temminck) in Imo State, Nigeria. *Int. J. Trop. Agric. and Food Syst.*, 2(1): 105-110.
- Skinner, J. and Chimimba, C. (2005). Lesser cane rat. In *The mammals of the South African Subregion*, 3rd edition. Cambridge: Cambridge University Press. 96-97.
- VAN der MERWE, M. (2000). Tooth succession in the greater cane rat *Thryonomys swinderianus* (Temminck, 1827). *J. Zool.* 251, 541-545.
- Van der Merwe, M. (2007). Discriminating between *Thryonomys swinderianus* and *Thryonomys gregorianus*. *African Zoology*, 42: 165-171.
- Van der Merwe, M. and Avenant, N. L. (2004). The cane rat, *Thryonomys gregorianus*, is a pest species that is expanding its range in southern Africa. *Navorsinge van die Nasionale Museum Bloemfontein*, 20:3-10.
- Woods, C. A. and Kilpatrick, C. W. (2005). "Infraorder Hystricognathi". In Wilson, D. E.; Reeder, D. M. *Mammal Species of the World* (3rd ed.). Johns Hopkins University Press. 1545.
- Yeboah, S. and P. K. Simpson (2004). A preliminary survey of ecto and endoparasites of the grasscutter (*Thryonomys gregorianus* Temminck); case study in Ekumfi central region of Ghana. *J. Ghana Sci. Assoc.*, 3: 2-5.