

Full Length Research Paper

# Public health implications of wildlife associated tsetse flies in Kainji Lake National Park, Nigeria

W. A. Ajibade\* and S. A. Agbede

Department of Veterinary and Public Health, Preventive Medicine, Faculty of Veterinary Medicine, University of Ibadan, Oyo State, Nigeria.

Accepted 13 October, 2019

A survey of tsetse flies was carried out at the two sectors of Kainji Lake National Park. Gourtex fly traps, the drum shaped and biconical-shaped, were used. The traps were set adjacently at the same location. Four traps were set in each vegetation zone. At Bourgu Sector 20 traps were set, while 24 were set at Zurgurma sector. Cattle and Pig urine (Mixture) were used as attractant. The traps were set in the mornings and harvested in the evenings. Harvests were reserved in 4% formalin and identified later in the laboratory under microscope. Three species of tsetse flies were identified. These include: *Glossina morsitans*, *Glossina palpalis* and *Glossina tachnoides*. They belong to the family *Glosidae*, the class *insect (hexapoda)* and order *Diptera* and genus *Glossina*. *G. morsitans* were found all over the wooded vegetation zones while *G. palpalis* and *G. tachnoides* were restricted to the Oli complex and the riverine vegetation zones at Borgu sector. At Zurgurma sector, *G. tachnoides* was restricted to the riverine forests of River Nuwanzurugi. The reason for these findings is that *morsitans* group mostly live in open savanna while the *palpalis*, which include *G. palpalis* and *G. tachnoides* inhabit the riverine area. The two types of traps, the biconical shaped traps and drum shaped, were equally efficient in catching flies ( $p \leq 0.05$ ) using one tailed t-test.

**Key words:** Tsetse flies, Tsetse traps, attractant, *Glossina morsitans*, *Glossina palpalis*, *Glossin tachnoides*.

## INTRODUCTION

Tsetse flies belong to the family Glosidae, the class of Insecta, the order of Diptera and genus *Glossina*. The family is divided into 22 species and 33 sub-species. They can be summarized into 3 groups; *G. morsitans*, the *palpalis* and the *fusca* group. The larger species are of *G. morsitans* mostly live within the open savanna, the *palpalis* group is limited to living along the rivers or riverine areas. The third group *G. fusca* inhabit tropical forest (Seifert, 1996) (Plate 1).

Tsetse flies are found only in Africa, south of Sahara and north of Republic of South Africa (Figure 1) although, there were flies in the north east corner of the Republics to southern Arabian up to 70 years ago, but there were none there now (Davies, 1977). *Glossines* are not distributed evenly since there are also areas which do not have an environment which is suitable for their physiological requirement within the tsetse belt.

Optimum temperatures are between 20 and 28°C with relative humidity between 50 and 80% and an annual rainfall of between 635 and 1524 mm (Seifert, 1996). The lower limits are 16 to 18°C, because at lower temperatures the fat reserved are used up; at higher temperature they metabolized too quickly.

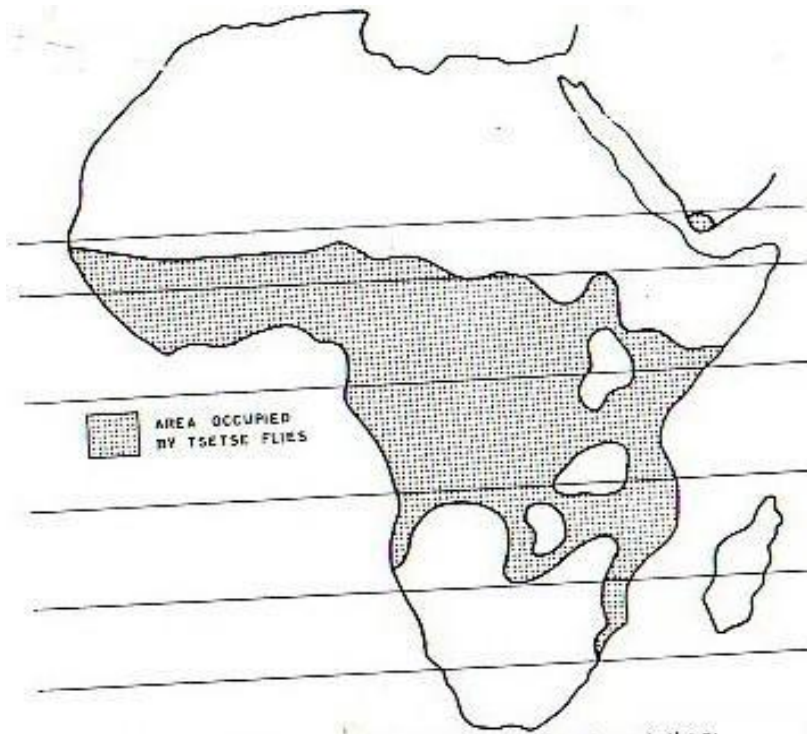
Tsetse flies are important because they transmit Nagana between the domestic animals and sleeping sickness between humans. The most important vector of bovine trypanosomiasis is the *G. morsitans* group. It transmits *Trypanosoma vivax* *Trypanosoma congolense*, *Trypanosoma brucei*, which cause Nagana *T. brucei gambiense* and *T. brucei rhodesiense*, which causes sleeping sickness, are mostly transmitted by flies of *G. palpalis* group, but also by the *G. fusca* group (Seifert, 1996; Cardonet and Mailard, 2002; Otto et al., 2003; Michael, 2008).

Davies (1977) observed that the important wildlife hosts for most Nigerian tsetse are Bush buck (*Tragelaphus scriptus*), Warthog (*Phacochoerus aethiopicus*) and Red River Hog (*Potamochoerus porcus*) with reptiles most important for riverine tsetse. While some wild animals

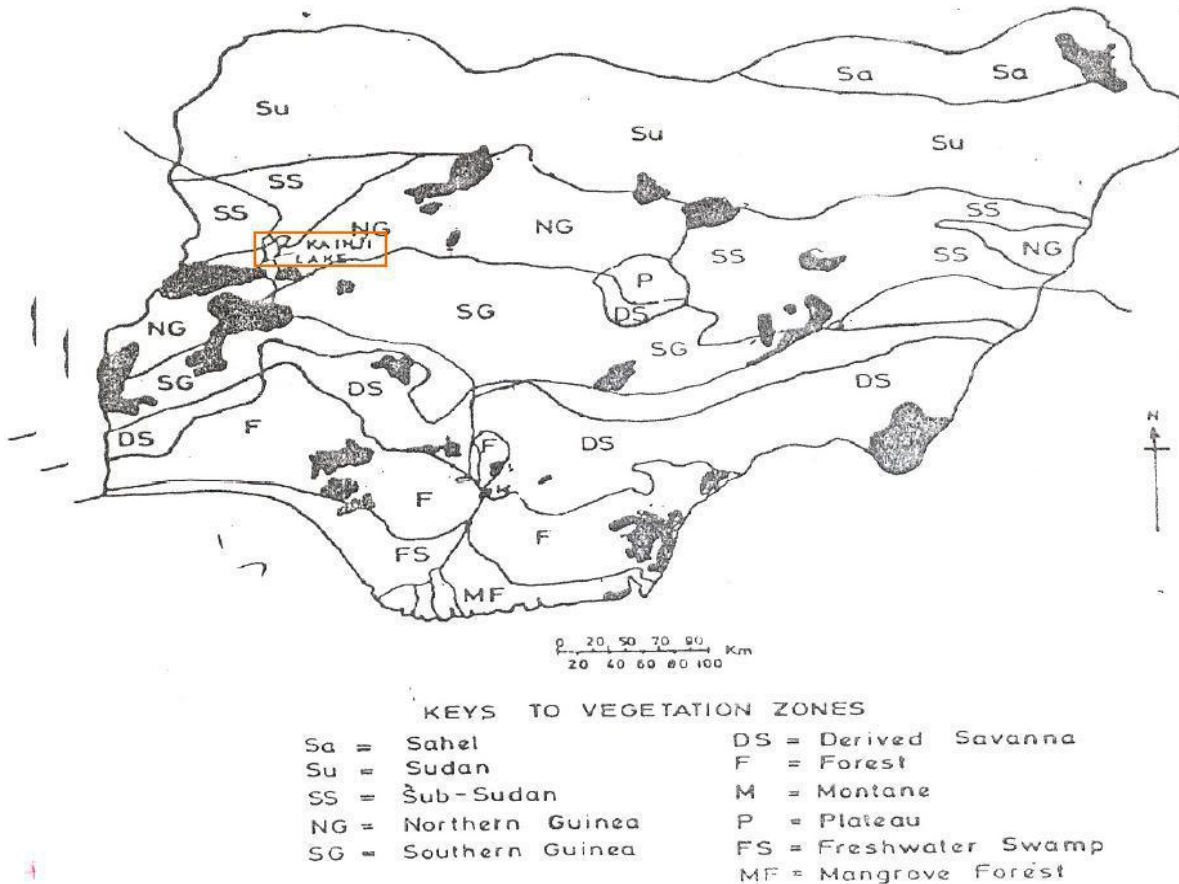
\*Corresponding author. E-mail: [ajibadeadedokun2k6@yahoo.com](mailto:ajibadeadedokun2k6@yahoo.com).



**Plate 1.** Drum-shaped and biconical-shaped traps for tsetse flies (Seifert, 1996).



**Figure 1.** Distribution of tsetse flies in Africa. (The locus shown in the ni  
Source: Davies (1977).



**Figure 2.** Map of Nigeria showing the approximate location of Kainji Lake National Park and Game Reserves in relation to the vegetation zones in Nigeria.

Source: Kainji Lake National Park Management Plan (2006).

such as Zebra (*Equus spp.*), Wilderbeast (*Connochaetes taurinus*), Duiker (*Cephalophus rufilatus*) and Waterbuck (*Kobus defassa*) are rarely fed upon by tsetse flies.

Kainji Lake National Park is located in the tsetse belt and the occurrence of tsetse flies is not misnormal (Figure 2). The purpose of this study is to confirm the occurrence of tsetse flies and identify the particular species. The knowledge will be very useful to the wildlife ecologist and epidemiologist that are concerned with the control and prevention of outbreak of diseases among the wildlife species, the domestic animals that are illegally grazing in the park and the public health.

## METHODS

Tsetse flies have light sensory and smelling organs, which assist them to recognize their hosts from distance. They have a special preference for dark and blue objects. This knowledge has been used for the designing or construction of their traps. The flies' traps are usually referred to as Gouteux traps and were described by Seifert (1996). The construction is also based on the knowledge that tsetse flies are attracted by the contrast between light and shade and seek shade and dark spots. The traps have two parts. The undersides are made of blue cloths with the inner lined with

dark cloths. The upper side is made of white synthetic nylon material with an open pointed end where a net is attached for harvesting.

Two types of tsetse traps were constructed; one is of the shape of the pyramid or double pyramid while the other is of a drum shape (Plate 1). The flies are attracted to the traps by the blue colour of the under-side of the traps and the attractant. The attractant is made of cattle and pig urine (mixture). They enter through the openings on the blue cloths into the dark region created by the dark cloths. As the flies are trying to get back to light at the upper sides of the traps, they will be trapped at the top pointed end by the net and be harvested.

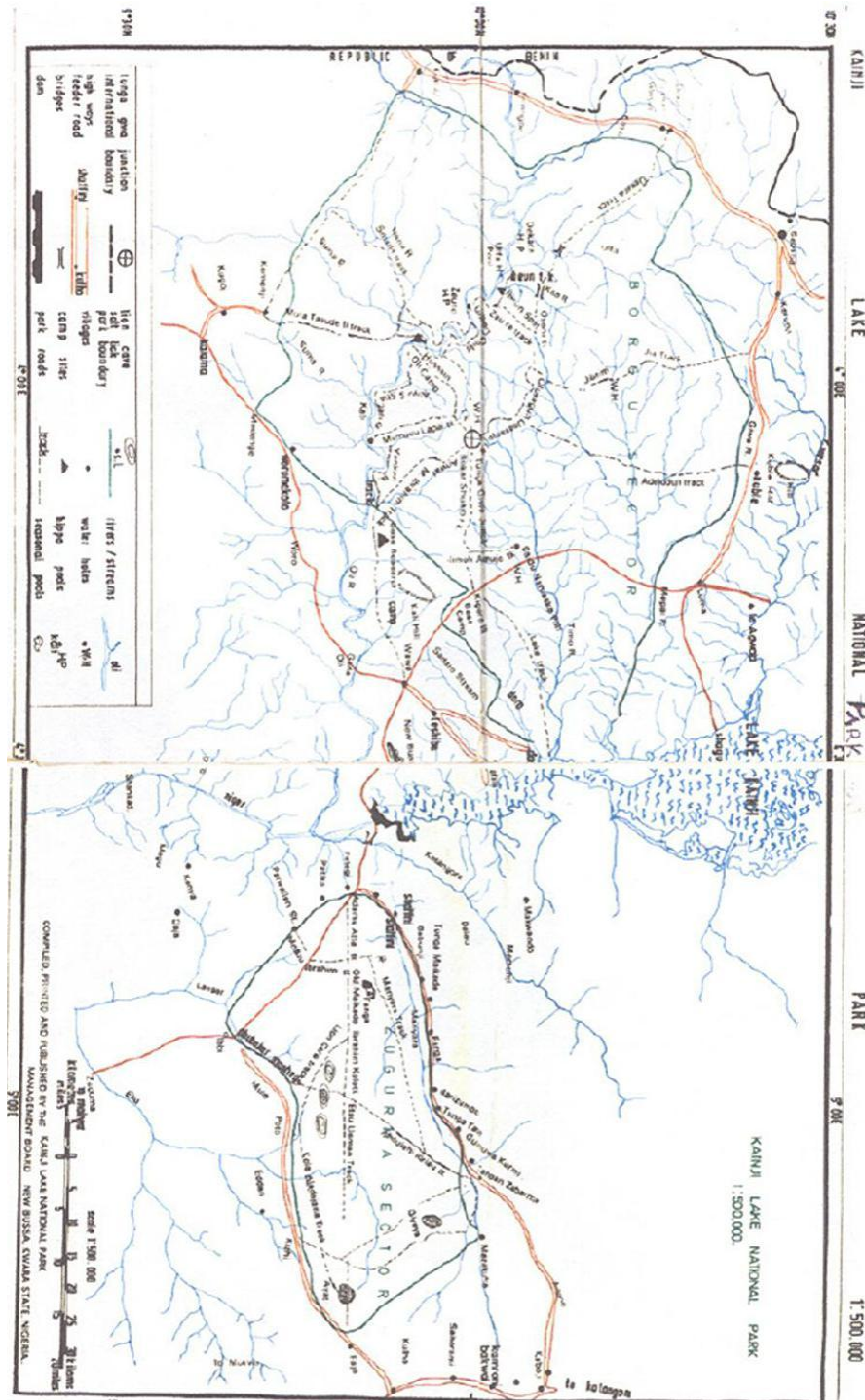
## Study area

The study area is Kainji Lake National Park, Nigeria. The Park covers an area of 5830 km<sup>2</sup> (Figure 3) (Marguba, 2002).

## Identification

Glossines are yellow brownish insects; their resting position is characterized by one wing covering the other like a pair of scissors. The typical proboscis with lateral palpa protrudes over the head looking like protruding tongue. The different species can be recognized by their leg markings, size and shape of their abdominal





**Figure 3.** Map of Kainji Lake national park.  
Source: Kainji Lake National Park Management Plan (2006).

segments.

### Statistical analysis

One tailed t-test was used to compare the mean catches of the two types of traps, the biconical-shaped and the drum shaped.

## RESULTS AND DISCUSSION

Table 1 shows the summary of Tsetse survey in Borgu Sector of the Park. Results show that *G. morsitans* were caught by the two traps all over the wooded savanna vegetation zones. *G. palpalis* and *G. tachnoides* were

**Table 1.** Summary of tsetse-fly survey in Borgu sector of Kainji Lake National Park.

Species	<i>Glossina morsitans</i>			<i>Glossina palpalis</i>			<i>Glossina tachnoides</i>		
	Vegetation type			1. Riparian; 2. Oil complex			Riparian oil complex		
Type of trap	Biconical shaped	Drum shaped	Total	Biconical shaped	Drum shaped	Total	Biconical shaped	Drum shaped	Total
1 <sup>st</sup> - 31 <sup>st</sup> July	28	20	48	26	18	44	24	21	45
1 <sup>st</sup> - 31 <sup>st</sup> August	50	54	104	60	64	124	45	40	85
1 <sup>st</sup> - 8 <sup>th</sup> Sept.	24	22	46	27	21	48	18	22	40
Total	108	96	198	113	103	216	87	83	170

**Table 2.** Summary of tsetse-fly survey in Zugurma sector of Kainji Lake National Park.

Species	<i>Glossina morsitans</i>			<i>Glossina palpalis</i>			<i>Glossina tachnoides</i>		
	Vegetation type			.....			Riparian oil complex		
Type of trap	Biconical shaped	Drum shaped	Total	Biconical shaped	Drum shaped	Total	Biconical shaped	Drum shaped	Total
1 <sup>st</sup> - 31 <sup>st</sup> July	...	...	...	...	...	...	18	26	44
1 <sup>st</sup> - 31 <sup>st</sup> August	...	...	...	...	...	...	41	27	68
1 <sup>st</sup> - 8 <sup>th</sup> Sept.	...	...	.....	...	...	...	26	25	51
Total	...	...	...	...	...	...	85	78	163

caught respectively both in the Riparian vegetation and Oli complex.

Table 2 shows the summary of tsetse flies survey in Zugurma sector of the Park. The specie of the flies that were caught in the Riverine of forest of River Nuwanzurugi was *G. tachnoides*. There were no catches of *G. morsitans* and *G. palpalis* in all the vegetation zones throughout the period of survey.

Habitats of *G. morsitans* were spread all over the wooded vegetation zones, while *G. tachnoides* and *G. palpalis* have been restricted to the River Oli complex, the vegetation at Borgu sector and Zugurma Sector. *G. tachnoides* is restricted to the riverine forest of river Nuwanzurugi. This finding is in line with the report of the Nigerian Institute for Trypanosomiasis Research (1999). Seifert (1996) reported that each species is to a specific ecology. Temperature and humidity as well as vegetation are limiting factors, which are especially important for the pupa period of the vector. Also the size of area of distribution of the fly population depends on the season of the year. During the late dry season when most part of savanna are defoliated and the climatic factors are drastically altered, the *Glossines* retreat into the area which do provide the shade during the season, and guarantee the environment required.

Although, no dissection was carried out, the probability for some of the tsetse being infected cannot be ruled out. Davies (1977) reported that the rate of infection of *G. morsitans* is 20%, while that of *G. palpalis* is 5% and *G. tachnoides* 6%. Since these infections are very harmful to livestock, with these rate of infections, it is advisable

that livestock (Cattle, Sheep and Goat) be kept away from the Park. Pastoralists that are keeping or grazing their animals in the Park are at high risk of their cattle contacting and dying of trypanosomiasis.

As regards the efficiency of the two types of the traps the total catches of each species by bi-conical traps were higher than those of the drum-shaped traps. However statistical analysis shows that there was no significant difference between the mean catches of the two types of traps ( $P \leq 0.05$ ).

## Conclusion

The presence of *G. palpalis* and *G. tachnoides* should be a cause of concern to the Management of the Park as it provides the risk of tourists and workers contacting sleeping sickness since these two species can transmit human trypanosome (*T. gambiense*). The presence of *G. morsitans* also implies that the domestic animals that are grazing illegally in the Park can contact the diseases trypanosomiasis.

## RECOMMENDATION

There is need to control and prevent the spread of the flies in the Park for the safety of the Park workers and tourist. As a result, biological control is highly recommended for the tsetse flies since it is a protected area.

## REFERENCES

- Cardonet B, Mailard A (2002). Training in Wildlife Epidemic surveillance. Training Document prepared for the training Workshop for park rangers at Yankari National Park, Nigeria on the 14th -18th January, 2002; 140p.
- Davies H (1977). Tsetse flies in Nigeria. Third Edition. Oxford University Press, Ibadan.
- Marguba LB (2002). National Parks and Their Benefits to Local Communities in Nigeria, pp. 1-48 ISBN – 978-056-724-0. Published by National Park Service; 48p.
- Michael MC (2008). Trypanosomias, p. 63. Essential Biology for Senior Secondary Schools (4th ed.). Publ. TONAD Publishes Ltd. 470p.
- Otto MR, Clive CG, Douglass CB (2003). Veterinary Medicine (9th Ed.), pp. 1-1877; Book Power Pub., formerly ELST, ISBN 0-7020-2750-2.
- Seifert HSH (1996). Biology and Eradication of Vectors and Animal Diseases in the Tropics. Tropical Animal Health. Publ. Kluwer Academic Press, pp. 53-145.