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The Population Structure and Physiological Status of Tsetse Flies in Abia State, Nigeria

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Abstract: Tsetse fly populations were sampled for one year, from April 2003 to March 2004 using bioconical traps for catching the tsetse at Isuikwuato, Ohafia, Isiala-Ngwa, Ikwuano and Umuahia South L.G. As (derived savannah area) of Abia State, Nigeria. A total of 613 tsetse flies were captured and the prevalence of the *Glossina* species population structure and physiological status in the area were carried out. The survey found *Glossina palpalis* (90.7%) as the predominant tsetse species in the area. There were significantly more ($p<0.05$) females than males in the species found. Higher tsetse density ($p<0.001$) was encountered during the rainy season than in the dry season and among the areas sampled, Isuikwuato LGA recorded the highest number ($p<0.001$) of tsetse flies caught. The tsetse population had higher proportion of hungry flies. The low prevalence rate observed here indicates a minimal effect on the population dynamics of the host of trypanosomes in Abia State, Nigeria.

Key words: *Glossina*, population structure, physiological status, dynamics, LGA

INTRODUCTION

Tsetse flies are confined to sub-Saharan Africa where they occupy discontinuous habitat. In Nigeria, the problem created by tsetse and trypanosomiasis are enormous. A total of 0.737 million km^2 (80%) out of 0.928 million km^2 landmass of Nigeria are infested by tsetse fly (Onyiah *et al*., 1983) and as such unsuitable for livestock production. Nigerian herd is annually exposed to different tsetse species as the animals traverse the various ecological zones in search of food especially during the dry season since rainy season is associated with increased vector numbers. Generally, also ruminant animals are regularly being transported from the northern part of the country to the State for sale and as well Abia State forms a route for semi-nomadic cattle rearing, all of which can influence transmission of trypanosomiasis. In most cases the infected animals go unnoticed and untreated thus rendering the break in transmission cycle difficult (Uzoukwu, 1981).

In many areas of endemic trypanosomiasis, the epidemiology of the disease and its vector (tsetse fly) is poorly understood. In Nigeria, studies have been carried out in many areas especially in the North and in central Nigeria (Kalu and Lawani, 1996; Kalu *et al*., 1991, 2001). However, there is dearth of information on tsetse and animal trypanosomiasis in Abia State, Eastern Nigeria. This study will throw light on the prevalence of tsetse, its population structure and physiological status in the State, which in anticipation will help wide-area control programmes in Nigeria at large.

MATERIALS AND METHODS

Study area: The study was conducted in Abia State, South-Eastern Nigeria. Abia State is located on latitude 4 to 6° North, longitude 7 to 8°E and altitude 244-305 m (highest point) above sea level. Mean annual rainfall is 187.7 mm. The soil is classified as ultisols by FAO standard. The major occupation of Abia State populace is crop farming. The cash crops grown in the State are palm tress, cocoa, cashew and rubber, while the food crops are cassava intercropped with maize, plantain, yam and cocoa yam. Domestic animals include goats, sheep, pigs, dogs and poultry. Game animals are very scarce (Data were from Abia State Ministry of Lands and National Root Crop Research Institute Umudike, Nigeria).

The Local Government Areas of the State covered were Ikwuano, Umuahia South, Isuikwuato, Ohafia and Isiala-Ngwa. These areas are located within the tropical rain forest or derived savannah vegetational zone. Pockets of forest scattered all over the State and Imo River with its tributaries in the sampled areas are significant characteristics. The choice of these places was

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based on high population of ruminant animals and presence of semi-nomadic herd rearers with their ruminant animals. Altogether two visits were made to each location per month for 12 months.

Biconical traps: Biconical traps used in this study were purchased from National Institute for Trypanosomiasis Research Vom, Plateau State, Nigeria.

Tsetse fly collection for vector studies: The presence of tsetse was studied in 5 locations within the State (Ikwuano, Umuahia South, Isuikwuato, Ohafia and Isiala-Ngwa Local Government Areas) using, at each sampling point, two unbaited biconical traps (Challier and Laveissiere, 1973) located 150 m apart on river banks, near dense/forest vegetation or on open savannah woodland where farm animals regularly graze. The entrapped flies were harvested after 8 h of daylight for two different days during each month from April 2003 to March 2004. Samples were taken to the laboratory for counting and further entomological evaluations.

Identification of *Glossina* adults: Adult *Glossina* were identified, gender observed and species differentiated based on morphological characteristics as described by Davis (1977), Smith (1973) and Service (1980). The physiological status was also established based on the method of Jackson (1948) and Nash (1969) and in this study, 5 physiological stages were documented: Tenerals, hungry, intermediate, gorged and pregnant.

RESULTS

Fly density in different sampling areas: The number of *Glossina* species identified in different locations sampled is presented in Table 1. Out of a total of 613 adult tsetse flies collected, 356 (58.1%) were females and 227 (41.9%) were males. Two species of *Glossina* were identified comprising *G. palpalis* (586, 90.7%) as the major fly and *G. tachinoides* (57, 9.3%). *G. palpalis* occurred in all the study collecting points. Curiously *G. tachnoides* was not found in Ikwuano and Umuahia South locations. The existence of gender differences was not consistent in all the species and study locations. For *G. palpalis*, the overall females flies were higher ($p<0.05$) than the males though male tsetse were higher in Ikwuano and Ohafia L.G.As. However, for *G. tachnoides* total gender difference was not observed.

Seasonal variation of tsetse fly catches: Monthly analysis showed that the highest number 211 (34.4%) of *Glossina* species were collected during the month of June (approximately 92% of this were *G. palpalis*) while the lowest number of catches occurred during December-March (average 0.6% of all catches) and these were all *G. palpalis* (Fig. 1). Rainy season (May to September) had significantly higher ($p<0.001$) prevalence 89.6% (549) of flies than during the dry season 10.4% (64). 92.2% of all fly catches during the dry season were *G. palpalis*.

Physiological status: The physiological status of the tsetse caught is shown in Table 2. In this study five physiological stages were documented: Tenerals, hungry, intermediate, gorged and pregnant flies. Hungry flies (60.7%) were significantly higher ($p<0.001$) than the other stages, followed by intermediate (33.9%) while the least is the pregnant flies (0.7%).

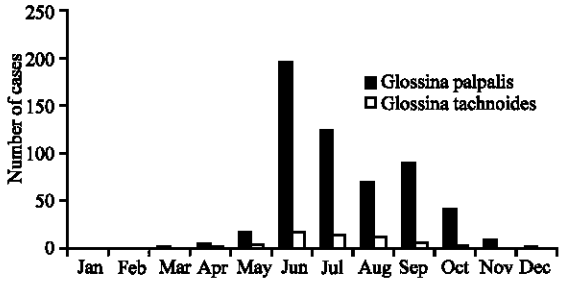

Fig. 1: Seasonal variation of catches of *Glossina* sp. number of cases by month for 613 testse files

Table 1: *Glossina* species density in different study locations from April 2003 to March 2004

	No. of tsetse flies			*Glossina palpalis*		*Glossina tachnoides*	
Study location	Total	Male	Female	Male	Female	Male	Female
Ikwuano	2	2	0	2	0	0	0
Isuikwuato	346[a]	131	215	107	196	24	19
Ohafia	208	105	103	101	99	4	4
Isiala Ngwa	33	13	20	11	16	2	4
Umuahia South	24	6	18	6	18	0	0
Gender total	613	257	356	227	329	30	27
(%)	100	41.9[b]	58.1	37.0[b]	53.7	4.9	4.4
Species total				556		57	
(%)				90.7[c]		9.3	

As compared to other locations [a]$p<0.001$ ($X^2 = 563.2$, df = 4), As compared to number of female tsetse flies [b]$p<0.05$, As compared to *Glossina tachnoides* [c]$p<0.001$

Table 2: Physiological status of *Glossina species* caught

Physiological status of fly	Number	(%)
Teneral	8	1.3
Hungry	372	60.7[a]
Gorged	21	3.4
Intermediate	208	33.9
Pregnant	4	0.07
Total	613	100

As compared to other physiological status of *Glossina* [a]p<0.001

DISCUSSION

The higher number of flies caught at Isuikwuato or Ohafia could be associated with availability of host animals probably influenced by settlement of semi-nomadic animals along these areas. In Nigeria, the agro-ecological setting governs seasonal livestock movements (transhumance) towards pastures of which Abia State is quite favourable for their settlement due to its suitable humidity and vegetation.

The observed difference in the gender of *Glossina* species caught in this study is in agreement with the work of Anavhe (1998) who also found more female than male tsetse in Urhobo. The higher number of female flies collected could probably be associated with females living longer than males and this has been collaborated by some authors (Challier and Gouteur, 1980; Jaenson, 1981). This uneven occurrence of tsetse species in different locations studied may perhaps be due to livestock density (as in some areas relatively few cattle were found) or dispersal of tsetse in search of host to feed on while total absence could mean that the said portion of the study area is free of *G. tachnoides* infestation as *G. palpalis* was found in all the study locations. Higher cultivation density activity as seen in the study area also contributes to reduce significantly the presence and abundance of *G. tachnoides*. Patches of vegetation (provided by available streams or river, which serve as tsetse habitat) may also have influence on both tsetse distribution and abundance (Rogers *et al*., 1996; Hendrickx *et al*., 2001). The predominant species is comparable to the report of Kalu and Uzoigwe (1996) in Jos, Plateau. Tenabe (1984) also stated that *G. palpalis* is the most widespread species in Nigeria. Baldry (1964) earlier reported *G. palpalis* and *G. tachnoides* in Nsukka area of eastern Nigeria. This predominance of *G. palpalis* in this study could be due to favourable atmosphere such as increased environmental temperature, rainfall and flourishing vegetation for the settlement of the fly. The traditional pastoral system influenced by southern transhumance appears to be the driving force behind high intensity of tsetse flies especially in areas like Isuikwuato and Ohafia. Very low prevalence of tsetse in Ikwuano area could be linked with a low pastoral movement. In addition high cultivation activity seen in this area, which is a very good ecological modification contributes to reduce significantly the presence and abundance of tsetse flies in an area.

The low density of flies during the dry season could be as a result of lack of suitable resting and oviposition sites for the flies. Nash (1970) also found reduced population during the dry season and several other workers from different areas have observed an increasing trend in the fly abundance from dry to rainy season (Kalu and Lawal, 1996). Dry season is normally associated with drying up of vegetation or bush burning and this leads to disappearance of tsetse as stated by Nash (1970). The observation here also indicates that *G. palpalis* can withstand the harsh dry season weather conditions far better than *G. tachnoides* (as evidenced in their negligible presence during this period). The preponderance of hungry flies could be related to scarcity of host animals to feed on and the very low density of pregnant flies might be attributed to low insemination as a result of females' inaccessibility to male flies or influenced by stress such as hunger or other factors (Mellanby, 1939; Anavhe, 1998). Moreover reproductive success of widely dispersed flies might be poor.

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