THE DISTRIBUTION, RELATIVE-ABUNDANCE AND THE EFFICIENCY OF TRAPS OF HAEMATOPHAGOUS FLIES AT ASSOP FOREST, PLATEAU STATE, NIGERIA.

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ABSTRACT

The distribution, abundance and level of parity of haematophagous flies species as evidence of public health nuisance was studied in Assop forest of Jos Plateau Central, Nigeria, using Nitse and biconical traps and by careful dissection of the flies. Of the 367 flies caught, 133(36.24%) were Glossina palpalis, 84(34.88%) were Stomoxys calcitrans and 150(40.87%) were the non-haematophagous fly of Musca species. The numbers of trapped haematophagous flies were significantly higher 127(34.60%) in the human activity area than 90(24.50%) in the cattle route area [Mann-Whitney U-test, Z= -2.752, p=0.006]. Nitse trap was found to be more efficient in the trapping of haematophagous flies in both human activity area [Mann-Whitney U-test,U=128, Z= -0.840, p=0.424] and cattle route area[Mann-Whitney U-test,U=53, Z= -0.414, p=0.744] than the biconical trap .The high presence of G. palpalis and S. calcitrans carries health implications because they are capable of transmitting Trypanosome the causative agents of trypanosomiasis, nagana, sura, anthrax and tularaemia. The findings are discussed.

KEYWORDS:-*Haematophagous flies, Distribution, Abundance, Assop-Nigeria.*

INTRODUCTION

The quantification of host-parasite association from field data is a fundamental step towards understanding host-parasite and host-parasite-pathogen dynamics (Cumming, 2004). Ectoparasites as parasites that live on the body surface of an animal and feed on the animal's blood, body tissues, lymphs, tears, sweat, skin debris, hair or feathers and they are of extensive and intensive livestock production (Philips, 2005)

The role of insects as evident public health nuisance has long been known in Nigeria and many African countries ((Manson-Bahr, 1963). Iwuala (1988) in a study revealed that heavy infestations by biting and haematophagous insects may account for sleeplessness feeding, production of abnormal behaviour including stereotypies and irritation (as with the case of mosquitoes, sandflies and bedbugs) but their most important role is the transmission of disease of malaria, dengue, yellow fever, filariasis, leishmaniasis, trypanosomiasis (sleeping sickness). He further asserted that heavy haematophagous flies infestation may also account for substantial blood losses and anaemic conditions in various host animals (as with intensive infestations by horseflies (*Tabanus*) and Tsetse flies.

Tsetse flies (*Glossina species)*, infect 10million km^2 of Africa and despite several commission and intensive research since the turn of the century (Duggan, 1970), little impact has been made by control programmes on the extent of the distribution of any tsetse species, " despite the enormous environmental changes (mostly adverse from the fly's point of view)brought about by the very great increase(approximately 3-7-fold for the tsetse-infested regions of Africa; McEvedy and Jones, 1978) in the human population over the same period. Tsetse flies feed at 2-3day intervals (Rogers and Randolph, 1985; Randolph *et al*, 1991; Hargrove and Williams, 1995), deposit their first larva after 14-18days, after at least 6 bloodmeals, and subsequent larvae at 7-10-day intervals (Hargrove, 1994; 1995), and have a mean adult female life-span of more than 5weeks.

The stable fly (*Stomoxys calcitrans*) is a haematophagous pest of cattle (Morgan *et al*, 1983). In the United States of America (USA) alone, financial losses caused by the fly as a result of weight loss and reduction of milk flow in cattle has been estimated at $398.9 million per year (Drummond *et al*, 1981). Stable flies feed everyday, lay their first batch of ~40eggs after 3-5days and 3-5 blood meals, with subsequent batches being deposited at 2-3days intervals, and they rarely live longer than 1-2weeks (Parr, 1962; Venkatesh and Morrison, 1980). Anderson and Roitberg's (1999) suggest that the life-history of stable flies are more strongly of persistent feeding behaviour and the acquisition of a full bloodmeal as compared to the life-history of tsetse.

The purpose of the current research was to determine the species composition and abundance of haematophagous flies in the study area and to compare the level of parity of the flies and the efficiency of Nitse and Biconical traps in the trapping of flies.

MATERIALS AND METHOD

Study Area

The study was carried out at Assop located in Riyom Local Government Area of Plateau State, Nigeria, with 09^{o}31N, 08^{o}37E in the human activity area and cattle route 09^{o}32N, 08^{o}38E from the month of June to July, 2006. Geographically, Jos Plateau extends from 8^{o}35N to 10^{o}11N South to North and 8^{o}21E to 9^{o}30 West to East.

On account of its high altitude the Plateau experiences a lower temperature compared with most parts of the country with the months of December and January experiencing a temperature of below 15^{o}C. The months of February and March record the highest temperature while the rainy season with its peak in June and August has temperature as low as 20^{o}C.

Riyom Local Government area is renowned for its tourist attractions, which include the various rock formations, Assop Falls and so on. Tourists and cattle consistently pass through this region as such become bait to these flies.

Trapping Types

Nitse Trap (as described in Green, 1987) and Biconical Trap (as described in Challier and Laveissiere, 1973) as used by Ryan and Molyneux, (1980) were used in the trapping of the insects.

Trapping Sites/Placement

Two sites were chosen *(i).* Human activity area (where activities like farming, tourists' site, bathing, washing and so on are carried out). *(ii).* Cattle route (The passage created by cattle from one area to another during grazing activity).The animals also serve as baits for the thirsty haematophagous flies. Three sets of traps (one trap each of Nitse and Biconical) were placed side by side at 2 different locations with each of the trapping sites 10 meters apart and were visited every 48 hours, 3 times a week for six weeks.(4 x 3 x 6 = 72 times). The study was conducted from the 5th of June to the 17th of July, 2006.

Harvesting/ Identification of flies

The two sites were visited for 18days and harvesting of flies was done by beating the sides of the traps to lure those flies outside the collection cage to move up into the cone. A mating tube was used to collect the trapped flies. They were then immobilized and preserved in 50 X 50ml sampling bottles containing 70% ethanol. The flies were taken to the laboratory and were sorted into various families, genera, and species according to the identification technique described by Crooskey (1973); Potts (1973) and Grzimek (1980).

RESULTS

Of the 367 insects flies caught, 237(64.58%) were caught by Nitse traps and 130(35.42%) by Biconical traps. Two species of haematophagous and one specie of non-haematophagous flies were collected. Of the haematophagous, 133(36.24%) were *Glossina palpalis*, 84(34.88%) *Stomoxys calcitrans* while 150 (40.87%) were non-haematophagous *Musca* species. Of the 133 *Glossina palpalis*, 76(20.71%) were caught by Nitse traps while 57(15.53%) by Biconical traps. Of the 84 *Stomoxys calcitrans* caught, 71 (19.35%) were caught by Nitse traps while 13(3.54%) by Biconical traps. Ninety 90(24.52%) and 60(16.35%) of *Musca* species were caught by Nitse by Biconical traps respectively (Table 1).

Table 2 the numbers of haematophagous and non-haematophagous flies caught at different study sites at Assop, Plateau State, Nigeria. Out of a total of 367 flies caught from both sites, 187(%) were caught from the human activity areas and 180(%) from the cattle route area. The numbers of the flies caught from the human activity area were as follows: *G. palpalis* 57(15.53%), *S. calcitrans* 70(19.07%) and *Musca* species 66(16.35%). In the cattle route area, the numbers were 30(8.17%), 60(16.35%) and 90(34.52%) for the respective species of flies.

Figure 1 shows the distribution of haematophagous flies across the study sites of human and cattle route areas with more of the flies caught from the human activity areas than the cattle route areas. [Mann-Whitney U-test U=223, Z= -2.752, P=0.06].

The efficiency of traps stationed across study areas showed that Nitse traps caught more haematophagous flies in the two study sites [Mann-Whitney U-test, Z= -0.971, P=0.331]. Figure 2.

On individual basis of the study sites, the efficiency of the trap in the human activity area showed Nitse to be more efficient [Mann-Whitney U-test, U=128, Z= -0.840, P=0.424] as shown in Figure 3, so also its efficiency at the cattle route area [Mann-Whitney U-test, U=53, Z= -0.414, P=0.744] as shown in Figure 4.

DISCUSSION

The study showed that more of the haematophagous flies were caught than non-haematophagous and that these flies co-exist without harm to one another. Waage (1979), observed that, of the twenty to thirty species of tsetse throughout Africa, up to 3 or 4 species frequently co-exists in any one place and that the co-existence of blood-sucking insects poses a theoretical problem than assumes practical importance when some of the species are more likely to transmit disease than are others. That blood suckers apparently rely on an identical food source and, but for minor differences in food preferences and in the part of the vertebrate from which the flies take blood would appear to provide a good example of ‘complete competitors’. During the present study, more haematophagous flies than non-haematophagous were caught from the study sites, the result suggests that haematophagous flies are attracted more to human vertebrates than their non-haematophagous counterparts with the sole purpose of satiating their blood desires.

It was found out that many of the flies were caught at the human activity area than the cattle route area, with the abundance of haematophagous flies at the human activity areas while the non-haematophagous at the cattle route areas. This study was carried out during the peak of the rainy season when human activity especially farming, tourist activity was at its peak and because of waterlogged and availability of green vegetation all over the place which as a practice in the study area permits for home grazing of these animals as compared to the dry season when they would have to be moved from one location to another in search of vegetation and crop residues. The distribution pattern of cattle, the main host of tsetse in the study area (Van den Bossche and Staak, 1997), along the transect undergoes significant seasonal changes. During the rainy season (Van den Bossche and De Deken, 2002), cattle are mainly found in miombo, whereas from June onwards cattle are disperse and are found in both Munga and Miombo. This distribution

TABLE: 1 ***Species composition of haematophagous and non-haematophagous flies caught at Assop, Plateau State, Nigeria.***

Fly	NITSE trap (%)	Biconical trap (%)	Total
Glossina palpalis	76(20.71)	57(15.53)	133
Stomoxys calcitrans	71(19.35)	13(3.54)	13
Musca species	90(24.52)	60(16.35)	60
Total	237(64.58%)	130(35.42%)	367

Table 2: ***Numbers of Haematophagous and non-haematophagous flies caught at different study sites at Assop, Plateau State, Nigeria.***

Study Site	***Species***	**No (%)**
Human activity area	*Glossina palpalis*	57 (15.53)
	Stomoxys calcitrans	70 (19.07)
	Musca species	60 (16.35)
Total		187(50.95%)
Cattle route area	*Glossina palpalis*	30 (8.17)
	Stomoxys calcitrans	60 (16.35)
	Musca species	90 (24.52)
Total		180 (49.05%)
Grand Total		**367**

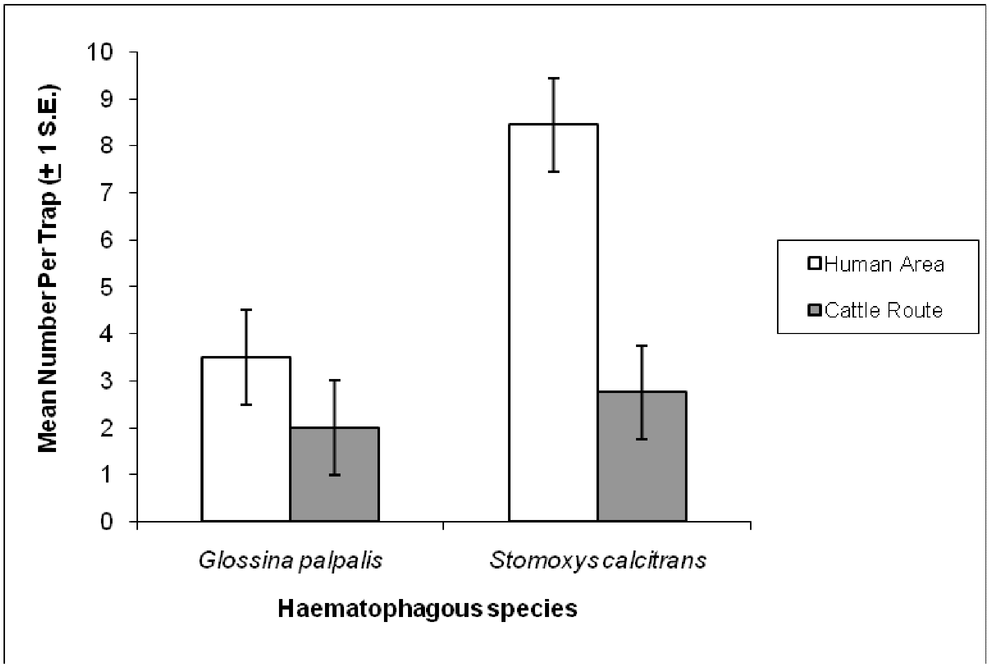

Fig. 1: Distribution of Hamatophagous species across study areas.

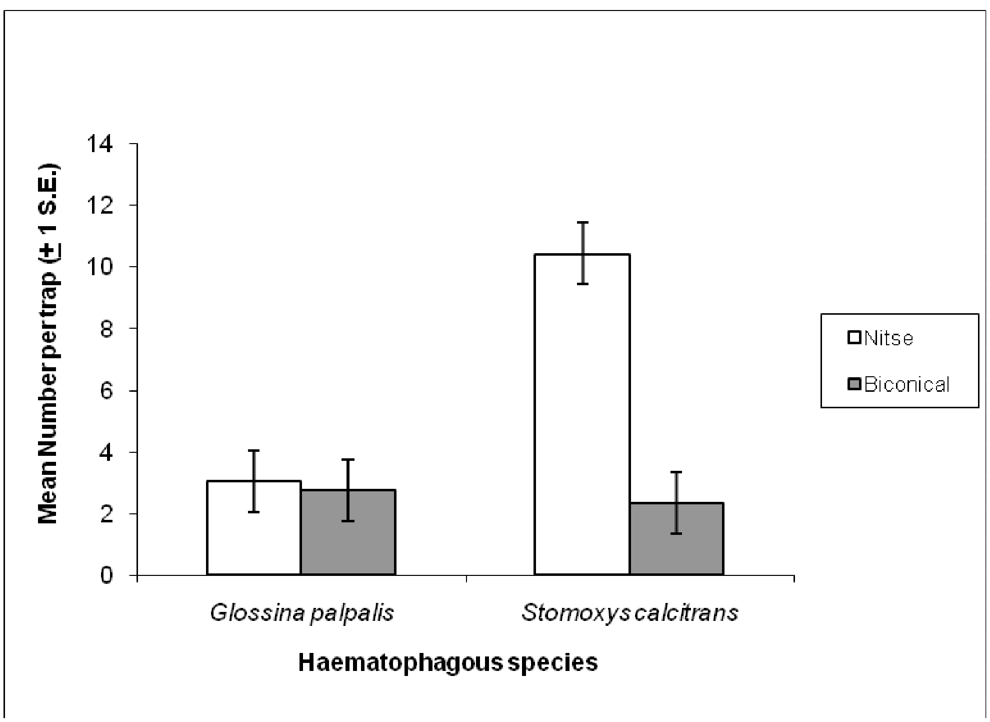

Fig.2: Efficiency of Nitse and Biconical traps on Haematophagous species

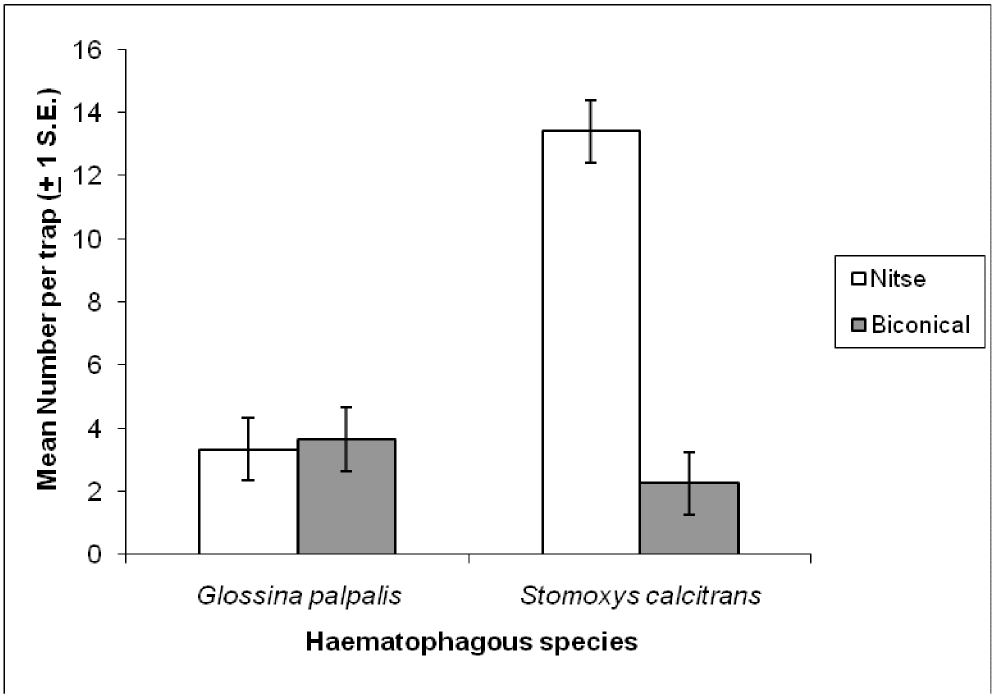

Fig. 3: Efficiency of traps in the human area.

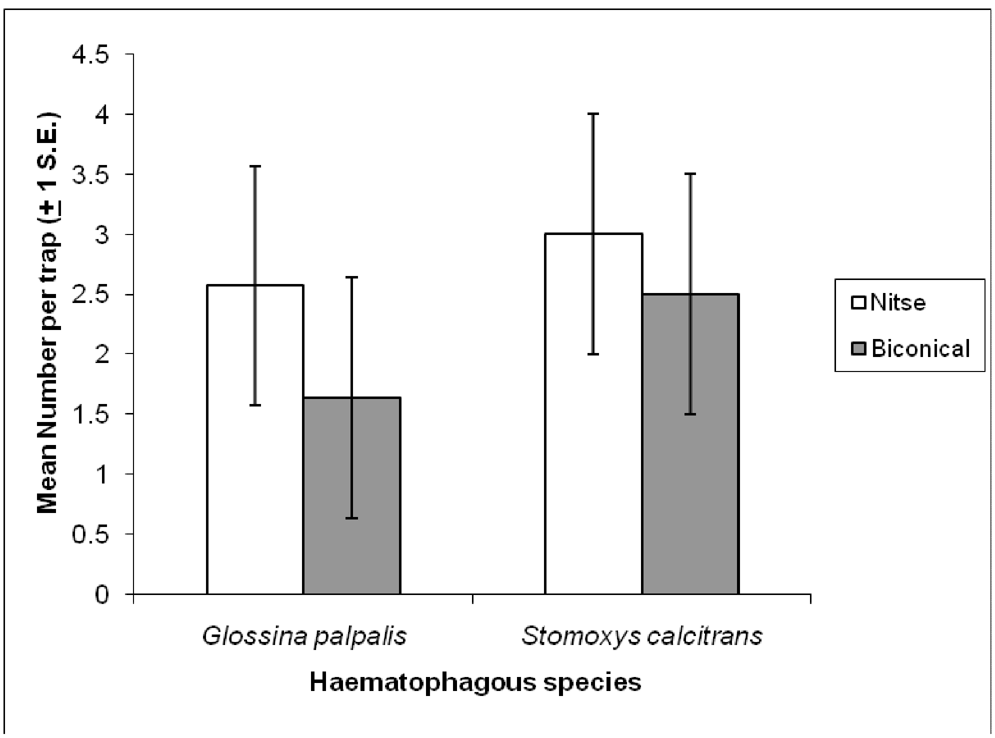

Fig. 4: Efficiency of traps in the cattle route area.

pattern is in accordance with changes in the management practices of communal cattle in eastern Zambia (De Clercq, 1997). During the rainy season, cattle are kept near the villages. To avoid crop damage, they graze mainly in miombo where food is abundant. They only enter munga when they are taken there for ploughing. The grazing pattern and management practices changes drastically after the crops have been harvested (June-July). Cattle are allowed to roam freely and feed unattended, mainly on crop residues, on fields surrounded by munga woodland. They are not kraaled at kraaled at night but returned to the kraals at regular intervals. At the start of the rainy season, when grass in miombo becomes available, cattle are again kept in miombo and herded away from germinating crops. The association between the distribution of tsetse and cattle has been observed elsewhere (Brightwell *et al*, 1992; Rawlings *et al*, 1994) and has important repercussions for the control of bovine trypanosomiasis in the cultivated areas of the eastern province of Zambia. Feeding in tsetse (Diptera: Glossinidae) results from a sequence of responses of host stimuli. First, the long-range location and orientation of some species of tsetse towards a host is in response to host odours (Vale, 1974a; Hargrove *et al*, 1995). Closer to the host, orientation responses are modulated by visual and olfactory cues produced by the host (Vale, 1974a; Green, 1986; Torr, 1989; Gibson, 1992).Finally, the landing, probing and emerging responses are affected by factors such as host colour (Green, 1986), size (Hargrove, 1980) and host behaviour (Vale, 1977; Torr, 1994; Baylis, 1996). Thus, the type and quantity of stimuli produced by a host affects the numbers of tsetse attracted to the host's vicinity and the probabilities that these locate, land, probe and feed on a particular host.

Nitse trap was found to be more efficient catch of the flies than the Biconical trap. This is in agreement with the field work carried out by Omoogun *et al*, (1994) at Yankari game reserve in Nigeria in Guruntun and Daban Maji areas where he reported that Nitse trap was more efficient than other traps including Biconical trap as it performs more effectively for trapping of haematophagous flies.

The parity of the haematophagous flies from the human activity areas and those from the cattle route areas were compared after careful dissection and it was found out that those from the human activity area were more parile; this could be attributed to the abundance of potential host during the rainy season at the human activity area than the animal route area.

The high presence of *G. palpalis and S. calcitrans* carries health implications as they have been implicated in the transmission of *Trypanosome* that causes the disease *trypanosomiasis* and are known to help in the transmission of nagana, sura, anthrax, tularaemia (Molloo, 1993).

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