ABUNDANCE AND DIVERSITY OF NON-MOSQUITO INSECTS OF IMPORTANCE FOUND DURING MOSQUITO SURVEILLANCE IN SELECTED RURAL HOUSES IN KWARA STATE, NIGERIA

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ABSTRACT: Insects control interventions in rural communities usually focus on malaria mosquitoes, neglecting other inimical entomological species. This study gives an account of abundance and diversity of non-mosquito insects of importance found during Pyrethrum Spray Collection (PSC) of endophilic mosquitoes in two rural communities in Kwara State, Nigeria. Non-mosquito insects found during mosquito surveillance in the two communities between August and October 2014 were collected and identified. Webbing clothes moths *Tineola spp* and Phorid flies *Megaselia spp* represented at least 20% of the non-mosquito insect species collected in each community. Phorid flies (28.8%), clothes moths (28.2%), silverfish *Lepisma spp* (38.7%) and carpenter ants *Camponotus spp* (4.3%) were found in both communities. Association of phorid flies with human myiasis and potential economic damage the cloth moth and silverfish could bring to scarcely available resources such as clothing and starch-based materials call for the sensitization of rural community residents on the economic importance of these insects. Indoor residual spraying of insecticides which is usually conducted against mosquitoes may as well control these other insects. However, improved housing and living conditions remain the permanent solution.

KEY WORDS: Rural communities, mosquitoes, non-mosquito insects, clothes moths, phorid flies, silverfish, Nigeria

The African rural poor are faced with several avoidable challenges resulting from the unavailability of basic amenities. The traditional mud houses inhabited by these rural population are usually without ceilings and window nets required to limit the entry of inimical insects such as mosquitoes. Other harmful terrestrial arthropods may find the bare floors in these houses more conducive to live and reproduce. The unhindered entry and access of mosquitoes to the inhabitants of rural African houses results in the intolerably high incidence of malaria which currently stands at 213 million cases in the WHO African region (WHO, 2019). Consequently, a lot of efforts are directed at reducing the malaria disease burden in Africa through malaria vector research and control.

One of the methods used in estimating the relative abundance of endophilic mosquito vectors in the rural communities is the pyrethrum spray catch. It involves the indoor spraying of non-residual insecticides and the collection of knocked down endophilic mosquitoes on white sheets spread to cover all the available spaces in each sprayed room (WHO, 2003). The nature of this mosquito collection method could also make it a veritable tool for collection of other insects of importance available in the rooms inhabited by the residents of these rural

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communities. This study gives an account of the abundance and diversity of non-mosquito insects of importance found during longitudinal pyrethrum spray collection of mosquitoes in two rural communities in Kwara State, Nigeria.

MATERIALS AND METHODS

Study area

The study was conducted in two rural communities in Moro Local Government Area of Kwara State, North Central, Nigeria. Both communities; Akorede (08°40.048N, 004°31.370E) and Lumoh (08°38.001N, 004°33.740E) were inhabited by peasant crop farmers living in mud houses. Harvested food products were found either on the bare floor (cassava tubers) or on clothing (fruits, vegetables, cereals) spread on the floors of the rooms in the communities. The community residents also gathered and displayed firewood piles for sale in front of the houses close to the road (Fig. 1). The two communities were selected for longitudinal mosquito collection based on similarities in housing patterns, human population, and baseline *Anopheles* mosquito indices (Obembe et al., 2019).



Figure 1. Front view of Lumoh community showing firewood piles displayed for sale.

Insect collection and identification

Pyrethrum spray collections (WHO, 2003) of endophilic mosquitoes were conducted once a month in ten selected rooms in each of the two communities. One room was selected per house based on the willingness of the occupants to allow monthly mosquito collection throughout the period of the study. Other details regarding the longitudinal mosquito collection procedures are available elsewhere (Obembe et al., 2018). Non-mosquito insects of importance knocked down (together with mosquitoes) on the white sheets spread to cover all available spaces in the rooms were collected between August and October 2014. The

numbers of each insect collected were recorded for subsequent identification at The Entomology Museum of the Crop Protection and Environmental Biology Department of the University of Ibadan, Ibadan, Nigeria.

RESULTS

Numbers of various insect species found in the two communities are presented in Table 1. Non-mosquito insect species belonging to four orders (Diptera, Lepidoptera, Thysanura and Hymenoptera) were found all through the sampling period. Phorid flies *Megaselia spp*, webbing clothes moths *Tineola spp*, silverfish *Lepisma spp* and carpenter ants *Camponotus spp* were found in both communities while houseflies *Musca domestica* (Akorede), fleshflies *Sarcophaga* spp. (Lumoh) and blowflies *Calliphora* spp. (Akorede) were found in either of the two communities. Silverfish (41.1%) and clothes moths (42.9%) were the highest occurring in Akorede and Lumoh communities respectively.

Table 1. Numbers of non-mosquito insect species found in the communities.

Insect orders	Common Name	Scientific Name	Community		
			Akorede N (%)	Lumoh N (%)	Total N (%)
Diptera	Phorid fly	*Megaselia* spp.	36 (25.5)	11 (26.2)	47(25.7)
	Housefly	*Musca* spp.	10 (7.1)	0 (0.0)	10 (5.5)
	Flesh fly	*Sarcophaga* spp.	0 (0.0)	7 (16.7)	7 (3.8)
	Blow fly	*Calliphora* spp.	3 (2.1)	0 (0.0)	3 (1.6)
Lepidoptera	Clothes moths	*Tineola* spp.	28 (19.9)	18 (42.9)	46 (25.1)
Thysanura	Silverfish	*Lepisma* spp.	58 (41.1)	5 (11.9)	63 (34.4)
Hymenoptera	Carpenter ants	*Camponotus* spp.	6 (4.3)	1 (2.3)	7 (3.8)
			141 (100)	42 (100)	183 (100)

Table 2. Percentages occurrence of non-mosquito insect species common to both communities.

Insect orders	Common Name	Scientific Name	Community		
			Akorede N (%)	Lumoh N (%)	Total N (%)
Diptera	Phorid fly	*Megaselia* spp.	36 (28.1)	11 (31.4)	47(28.8)
Lepidoptera	Clothes moths	*Tineola* spp.	28 (21.9)	18 (51.4)	46 (28.2)
Thysanura	Silverfish	*Lepisma* spp.	58 (45.3)	5 (14.3)	63 (38.7)
Hymenoptera	Carpenter ants	*Camponotus* spp.	6 (4.7)	1 (2.9)	7 (4.3)
			128 (100)	35 (100)	163 (100)

Both clothes moths (Akorede 19.9%; Lumoh 42.9%) and phorid flies (Akorede 25.5%; Lumoh 26.2%) (shown in Figure 2) represented at least 20% of the non-mosquito insect species collected in each of the communities (Table 1). In Table 2 where the insects not found in both communities were excluded, addition of the numbers of non-mosquito insects common to both communities showed that silverfish (38.7%), phorid flies (28.8%) and clothes moths (28.2%) were the most prominent insect species encountered in both communities (Table 2).

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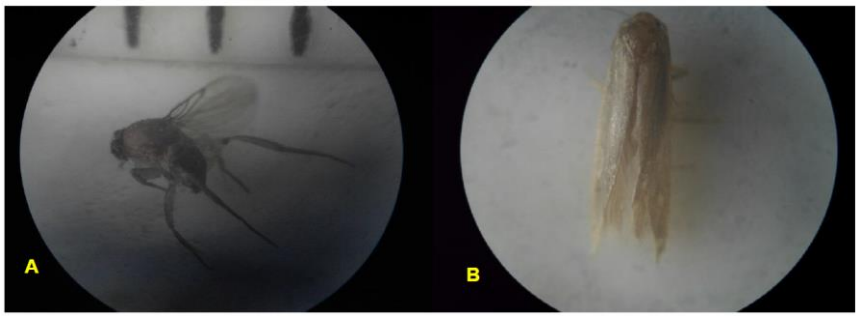


Figure 2. Samples of A- Phorid Flies *Megaselia* sp. and B- Cloth moth *Tineola* spp. collected from the communities.

DISCUSSION

An account of abundance and diversity of non-mosquito insect species found during pyrethrum spray collections of endophilic mosquitoes in two rural communities is presented. Occurrence of clothes moths and phorid flies, as representing at least 20% of the insects found in each community is noteworthy. Clothes moths *Tineola* spp. larvae feed on organic–rich dusts, hair, animal wool and fur and are usually attracted to clothes soiled by food and perspiration (Querner, 2016). Unwashed farm garments used as regular farm uniform were observed in corners of the rooms surveyed in this study. These sweat-laden garments together with potential food materials such as organic-rich dusts available on the bare floors of the rooms in these communities may be responsible for the occurrence of clothes moths in the rooms.

Silverfish eats fabrics, starch in clothing, cereals, paper and other materials rich in starch (IDL, 2012) and could have been drawn to the books and cereals available in the rooms in the communities. Harvested fruits, vegetables and cereals spread on clothing in the rooms could also have attracted the female phorid flies *Megaselia* spp. known to lay eggs on the decomposing parts of these kinds of food materials (Wakid, 2008; Karunaweera et al., 2002). Notable occurrence of phorid flies could also be linked to the affinity of their parasitoid larvae to the varieties of other insects found in the rooms in this community. Earlier reports of phorid fly larvae feeding on a wide range of living arthropods such as Orthopterans (Gregorio & Léonide, 1980), Dipterans (Batista-Da-Silva, 2012), Lepidopterans (Robinson, 1971; Chacon de Ulloa & Rojas de Hernandez, 1981) and Hymenopteran insects (Zanon, 1991) have been described in literature.

Phorid flies have been linked with human myiasis which is the invasion of live human tissue by Dipteran larvae. Human myiasis cases involving *Megaselia* species larvae invasions of leg (Hira et al., 2004) and chest (Hardy, 1951) wounds have been reported. *Megaselia* species have also been implicated in intestinal (Hira et al., 1997) and human urinary myiasis (Wakid, 2008). Phorid flies are capable of mediating ant community structure (Mitra et al., 2016) and may have contributed to the low numbers of ants found in the rooms. Apart from living in dead trees and wood piles, carpenter ants are known to feed on food scraps and other insects (Writer, 2014) identified in the rooms in these communities. Higher number of carpenter ants than the one collected may have been initially attracted

from the firewood piles outdoors to the food scraps and other insect found in the rooms.

The potential damage the webbing clothes moths larvae is known to cause to clothing materials should make the prominent occurrence of this insects of concern in these kind of communities inhabited by people that are unable to afford much of decent clothing. The silverfish insect *Lepisma* spp. damages books. Such damage may be substantial if done to the few school books owned and kept in the rooms by the children of the poor farmers in these communities. Some of the children attend the local community or government school close to their communities. Both silverfish and phorid flies could also damage the harvested food products and other starch-based materials stored in the rooms in these communities. Indoor residual spraying of insecticides against mosquitoes may as well control these non-mosquito insects though improved housing and living conditions remain the permanent solution.

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