



Study Of The Insect Pests Of Storage Fish In Lapai And Minna Metropolis, Niger State, Nigeria

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ABSTRACT

The insect pests that infest stored smoked fish in Lapai and Minna Metropolis markets, Niger State, Nigeria were studied between May 2017 and July 2017. Smoked samples of *Oreochromis niloticus*, *Clarias gariepinus*, *Citharinus citharus* and *Synodontis spp.* were collected from Badeggi, Lapai main market and Efu - gwaja within Lapai metropolis, and Kure market, Mobile market, Gwari market, and Chanchaga market within Minna metropolis. Three (3) major insect pests, two resident pest - golden stage beetle (*Lamprina aurata*) and *Dermetes maculatus*, one visiting pest - *Musca domestica* were found in the smoked fish. Golden stage beetle infested only *O. niloticus* while *C. gariepinus* and *C. citharus* were infested by *D. maculatus*. *M. domestica* (common housefly) visited all the smoked fish with *Synodontis* species being least visited. Monthly occurrences of golden beetle and *D. maculatus* in *O. niloticus* and *C. gariepinus* respectively followed the same trend of infestation in these metropolis. The infestation caused smoked fish to break into pieces, unattractive and powdery - like substance discharge that resulted to quality and quantity loss. *D. maculatus* serve as vector for diseases to humans and mould, which is a fungi that would have negative effect on human health. Periodic hot smoking of fish, provision of screened retail tables, adequate packaging and proper storage need to be put in place, fungal as well as microbial analyses of smoked fish need to be done so as to checkmate insect pests infestation and mould growth. This would ensure safe smoked fish for consumption within these metropolises.

Keywords: Insect pest, *Dermetes maculatus*, Lapai, Minna

INTRODUCTION

Fish is one of the cheapest sources of animal protein in Africa. Small-scale fisheries play an important role in fish production especially in West Africa. It supplies a large number of people with affordable high quality animal protein. Fish, however is highly susceptible to deterioration especially if not well preserved (Okonta and Ekelemu, 2005). It is a perishable food material; its flavour and texture changes rapidly during storage after death. The smoked type of fish is commonly sold in the market both at urban and rural settlements and used in many local dishes in Nigeria. Fish consumption is not forbidden within religious groups unlike eating pork and dog (Agbelege and Ipinjolu, 2001). As a result, fish has been consumed by large proportion of the population and has become a staple diet. With the rising cost of meat and cheese protein foods, consumers have become increasingly interested in fish as a source of dietary protein (Okonta and Ekelemu, 2005).

There are different methods of preserving fishes. The most common and popular means is smoking. However, this does not completely guarantee other challenges faced during storage of fish. Smoked fish suffer considerable weight loss as a result of damages caused by insects' pests and mites. FAO (1989) reported that in adverse condition, up to 30% of smoked or stored fish is lost due to flies infest during the period of processing and up to 50% as a result of beetle damage. Infestation of smoked fish by insect pests could also pose public health hazards as some of them are diseases vectors promoting growth of pathogens to man and other creatures. Public health hazard may lead to intestinal disorders and allergies (Osuji, 1985). These insect pests of foodstuffs can be grouped into two : visiting pests and resident pests (Busvine, 1980).

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This study aimed to identify the insect pests of stored fish in Lapai and Minna metropolis, determine the extent of damage on smoked fishes and Health implications by these pests.

METHODOLOGY

Study area

Lapai (Latitude 8°49'N, Longitude 6°41'E) is the headquarters of Lapai Local Government Area of Niger State. It is about 75km from Minna, the state capital with a population of 110,127 from 2006 census. Minna (Latitude 9°37'N, Longitude 6°16'E) is the state capital of Niger State with population estimated at 350,287 from 2006 census.

Sampling of smoked fish

Three (3) markets - Badeggi, main market and Efu-gwaja within Lapai town where smoked fish are sold were visited and four (4) markets - Kure market, mobile market, Gwari market, and Chanchaga market within Minna metropolis were also visited. These collections were done between May and July, 2017. Sampled smoked fish sold at these markets were purchased from different fish sellers especially those with signs of insect's pest infestation. The frequency of sampling was twice per month. Each fish sample was sealed in polythene bags and well labeled. Fish samples were identified to species using manual by Idodo-Umeh (2003) and also from fish sellers using their local names. Samples purchased were taken to Biology Laboratory at Ibrahim Badamasi Babangida University, Lapai, Niger State for analysis.

Analysis of smoked fishes for insect pest collection

Sample of each smoked fish collected was examined virtually, and also with hand magnifying lens to remove insects pest according to the standard methods (FAO, 1989). Those that wriggled out from each sample were collected in separate labelled containers according to fish species. Intact samples were also dissected to make sure that no insect pest was left out unscored.

Fish samples of each species were combined together in a container and exposed around dwelling houses and monitored closely for 2 hours. Insect net was used to arrest the insect pests perching on the fish samples. The pests were examined and collected into separate labeled containers. The numbers and types of insects pest collected were noted as the fish deteriorates. Fish samples in this case were exposed twice in a week within three (3) months, that is May 2017 to July 2017.

Analysis of Insect pests

Both dead and alive insects encountered were identified in the laboratory using the identification manuals, vouchers and taxonomic keys as describe by Osuji (1985), FAO (1989) and Nayar *et al.* (1992). The number of each insect pest recorded was expressed in percentages for the different fish species. This was done for each metropolis and twice on monthly basis for the period of study.

RESULTS

Table 1 indicates insect pests of smoked fish sampled from Lapai and Minna metropolis. *Lamprina aurata* and *Dermestes maticulatus* were identified as pests of the smoked fish in the metropolis. *Oreochromis niloticus* species was infested by golden stage beetle of which 83% were immature and 17% were adult with respect to samples from Lapai, and 72.70% were immature and 27.30% were adult on the samples from Minna. *Clarias gariepinus* and *Citharinus citharus* were infested by *D. maticulatus* with more immature (96.43% and 66.67%) than adults (4.57% and 33.30%) respectively in Lapai and also in Minna (80.40% and 100%) for immature and (19.60%) in adult *Clarias gariepinus*. No adult *D. maticulatus* infestation in *C. citharus* in Minna metropolis, were identified.

Table 1: Insect pests of smoked fish in Lapai and Minna Metropolis, Niger State, Nigeria

FISH SPECIES	INSECT PEST	Lapai		Minna	
		No.	Percentage (%)	No.	Percentage (%)
<i>Oreochromis niloticus</i>	Golden stage beetle				
Immature		44	83.00	56	72.70
Adult		9	17.00	21	27.30
Total		53	100.00	77	100.00
<i>Clarias gariepinus</i>	<i>Dermestes maticulatus</i>				
Immature		27	96.43	37	80.40
Adult		1	4.57	9	19.60
Total		28	100.00	46	100.00
<i>Citharinus citharus</i>	<i>Dermestes maticulatus</i>				
Immature		4	66.70	7	100
Adult		2	33.30	0	0
Total		6	100.00	7	100.00

Figure 1 depicts the monthly (%) occurrence of golden stage beetle (*Lamprina aurata*) as insect pest of smoked *O. niloticus* in Lapai and Minna Metropolis. May had the highest infested fish (47.70%) in Lapai followed by June (27.30%) and the lowest was July (25.00%). Similar trend was also observed in Minna with 41.10% infestation in May, 32.10% in July, and 26.80% in July.

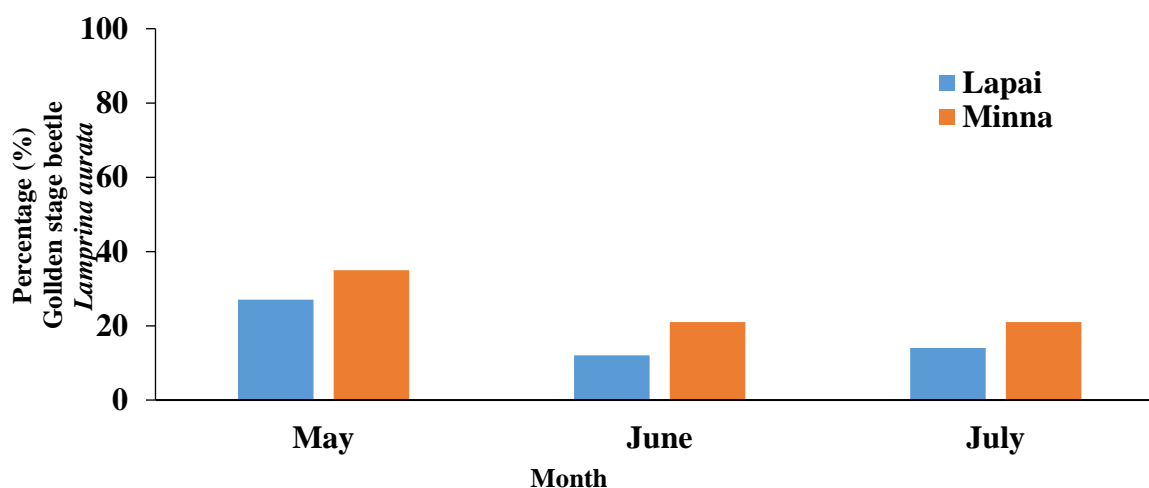
Figure 1: Level of attack of *Lamprina aurata* on *Oreochromis niloticus* samples

Figure 2 depicts the monthly (%) occurrence of *D. maticulatus* in smoked *Clarias gariepinus* in the two metropolis during the period of study. June had the highest (59.10%) in Lapai followed by May (34.10%) and July was lowest (6.82%). June was also highest (54.20%) in Minna followed by May (39.60%) and July was lowest (6.25%).

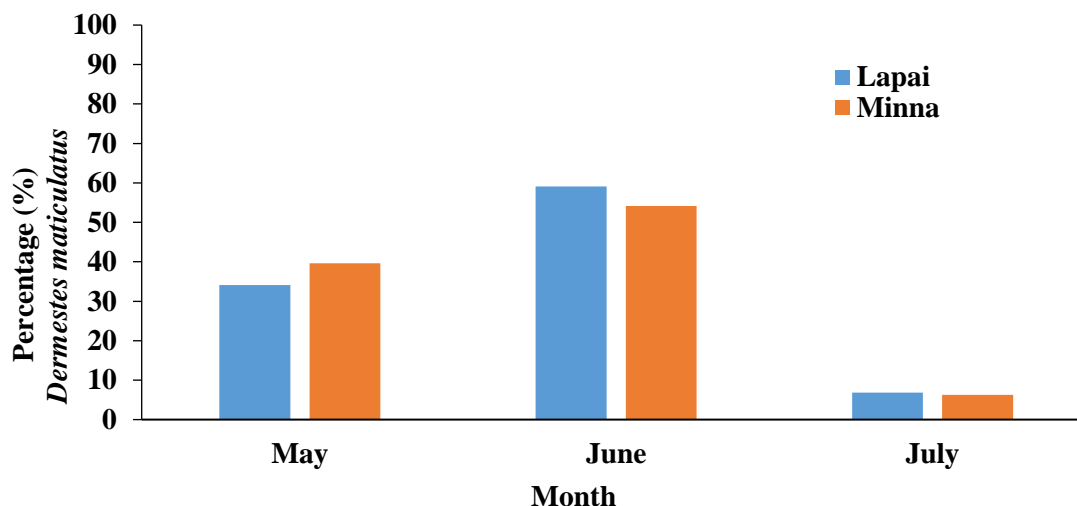


Figure 2: Level of attack of *Dermestes maticulatus* on *Clarias gariepinus* sample

Figure 3 depicts monthly (%) occurrence of *D. maticulatus* in smoked *Citharinus citharus* in the two metropolis during the period of study. May recorded the highest infestation (57.1%) in Minna followed by June (42.9%) with none in July. June recorded highest infestation (66.67%) in Lapai followed by May (33.33%) with none also in July.

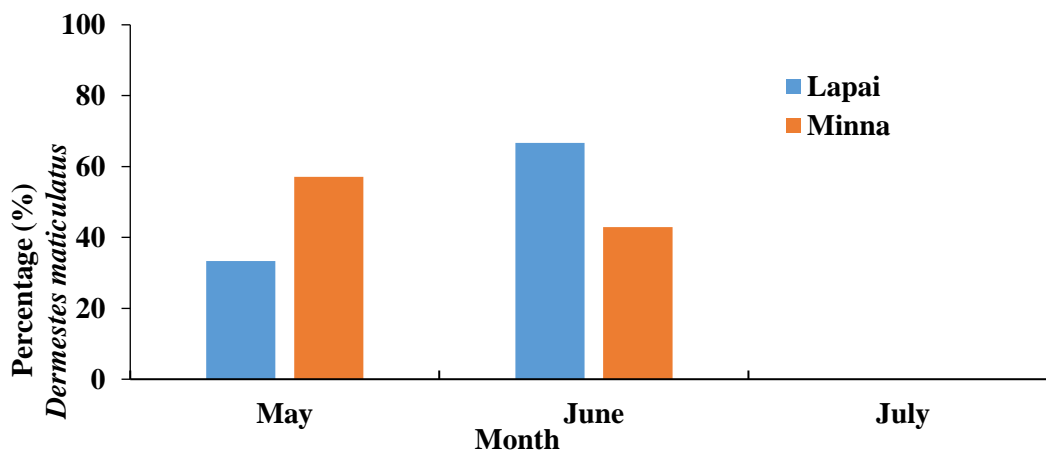


Figure 3: Level of attack of *Dermestes maticulatus* on *Citharinus citharus* samples

Table 3 indicates the percentage of *Musca domestica* as insect pest that visited smoked fish exposed at home in Lapai and Minna Metropolis during the period of this study.

Clarias gariepinus was the most visited (35.91%) by this insect followed by *Oreochromis niloticus* (35.91%), then *Citharinus citharus* (22.73%) and *Synodontis* species (7.72%) was the least visited. *Musca domestica* visited all the smoked fish exposed at home during the period of study regardless of the type of species.

Table 3: *Musca domestica* infestation on smoked fish samples kept at home between May and July, 2017 in Lapai and Minna Metropolis, Niger State, Nigeria

Fish	Insect Species	No.	Percentage (%)
Cichlidae			
<i>Oreochromis niloticus</i>	<i>Musca domestica</i>	74	33.64
Clariidae			
<i>Clarias gariepinus</i>	<i>Musca domestica</i>	79	35.91
Citharinidae			
<i>Citharinus citharus</i>	<i>Musca domestica</i>	50	22.73
Mochokidae			
<i>Synodontis</i> species	<i>Musca domestica</i>	17	7.72
Total		220	100.00

DISCUSSION

Over the years, different fish species have been processed using common traditional method of smoking and stored for human consumption. Many fish species found in freshwater have very good qualities after being smoked on preservation (Madu et al., 1984). *Oreochromis niloticus*, *Clarias gariepinus*, *Citharinus citharus* and *Synodontis* species from four genera were sold smoked at these metropolis. Eke et al. (2008) reported 10 genera of smoked freshwater fish at Ogige market which included *Synodontis* and *Oreochromis*. This could be due to the availability of these species of fish in such locality.

Two resident insect pests - golden stage beetle and *Dermestes maculatus* and one visiting pest - *Musca domestica* (housefly) infested smoked fish samples in these metropolis in addition to mould (fungal) that was observed. Eke et al., (2008) reported nine insect pests of smoked fish with five resident and four visiting pests, which is higher than this study. This could be due to the differences in fish species, suitability of the environment for the survival of these pests, it support life cycle and serve as source of food for immature stages. *D. maculatus* and *M. domestica* (housefly) were also reported, which agree with the findings of this study. Despite the fact that smoked fish were collected from different locations, although within Niger State, there were no differences in the insects' pest (Eke et al., 2008).

There were variations in insect pests infestation within these metropolis. While smoked *O. niloticus* was only infested by golden stage beetle mould (fungi) was only observed on *Synodontis* species. Eke et al. (2008) reported *Calliphora* spp. (blowfly) and *P. americana*

(Cockroach) as pests of *O. niloticus* and *Synodontis* species. This contradicts the findings of this study. This could be due to the absence of such insects in the locality or the non-conduciveness of the environment for their survival. Golden stage beetle at immature stage infested *O. niloticus* more than adults in both Lapai and Minna Metropolis. Likewise in the case of *D. maculatus*, where immature stages infested *C. gariepinus* and *C. citharus* more than adult. This could be due to the period of development of these insects'. *O. niloticus* was the most infested or attacked by insect pests in these metropolis. This could be due to their preference of the fish species to others. It is also important to note that *D. maculatus* infested two species of smoked fish (*Clarias gariepinus* and *Citharinus citharus*) in these metropolis hence making it a common pest. Iyabo (2015) also reported *D. maculatus* as a well-known pest of smoked fish. This also support the findings of this study. *M. domestica* commonly known as house fly was the only visiting insect pest observed because the smoked fish were left open or exposed. Although, ratio of visitation differs from species to species with *C. gariepinus* being the most visited and *Synodontis* species the least visited. Eke et al., (2008) also reported *M. domestica* as visiting insect pest of smoked fish samples.

Monthly occurrences of golden stage beetle infestation in *O. niloticus* and *D. maculatus* in *C. gariepinus* followed the same trend (May < June < July) in both Lapai and Minna Metropolis during the period of study. This is contrary to the monthly occurrence of *D. maculatus* (June < May) in *C. citharus* in Lapai metropolis. The absence of *D. maculatus* in *C. citharus* during the month of July in both

metropolis could be due to the fact that this insect at adult stage infest smoked fish at a lesser percentage than other stages during development.

Smoked fish are quite brittle and can easily get damaged. Physical damage according to Davies (2005) can occur during storage, transportation and the process of marketing. The presence of these insect pests especially *D. maculatus* caused considerable damage to smoked fish in both metropolis. Most of the smoked *C. gariepinus* were easily broken into pieces or damaged, hence losses in both quantity and quality. This is supported by the findings of Ayuba and Omeji (2006) that insect infestation on fish is the cause of most losses in the quality and quantity of smoked fish in Nigeria.

Fish is an important, nutritious and healthier source of animal protein that has contributed to improve health and disease prevention in human (Kabaherda *et al.*, 2009). However, some of the insect pests of smoked fish have the potential to serve as vectors or transmitters of diseases to humans. Adult *D. maculatus* according to Adedire and Lajide (2000) have the ability to fly and easily dispersed to other sources of food and damage them, exposing the infested fish to attack by microbes. *D. maculatus* has also been reported as pest of other food source such as carcasses, hide and skin, meat and dead animals.

Conclusion

Golden stage beetle, *D. maculatus* and *M. domestica* were insect pests found in the smoked fish in Lapai and Minna metropolis. While *D. maculatus* was the dominant insect pests, *M. domestica* visited all the smoked fish exposed regardless of the species. The presence of *D. maticulatus* and *M. domestica* poses health concerns to fish consumers in these metropolises.

Recommendations

There should be periodic hot smoking of the fish as this will help to check insect pests infestation and mould growth. Retail tables screened with wire mesh should be used to display fish at these markets. Smoked fish should be properly packed and stored. Fungal as well as microbial analyses of smoked fish should also be done regularly to ensure there is no infestation.

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