

ARTHROPOD PESTS OF DRIED FISH AND FISH BY PRODUCT IN A TROPICAL URBAN COMMUNITY MARKET

EKE, Felicia Nkechi., EKECHUKWU, Nkiru Esther and ONAH, Ikechukwu
Department of Zoology, University of Nigeria, Nsukka, Enugu State, Nigeria

Corresponding Author: Eke, F. N. Department of Zoology, University of Nigeria, Nsukka, Enugu State, Nigeria.
Email: fellyaustin4real@yahoo.com Phone: +234 8039598020

ABSTRACT

A four months research survey of arthropod pests infesting dried fish sold in a tropical urban community market (Ogige), Nsukka, Nigeria showed that 10 genera of dried freshwater fish (Synodontis, Hemisynodontis, Oreochromis, Hepsetus, Gymnarchus, Labeo, Protopterus, Heterobranchus, Alestes, Heterotis) and two species of cod fishes sold in the market were arthropod infested. The pests were extracted by illumination and cracking methods and identified using relevant taxonomic keys. Voucher specimens were kept in the Museum of Natural History, Department of Zoology, University of Nigeria. Each of the fish genera harboured at least one of the following arthropods: Dermestes maculatus, Necrobia rufipes, Lardoglyphus konoii, Theridion saxatile and Tribolium castaneum. T. castaneum was found only in fish bones in the stall. Besides the resident pests, Periplaneta americana, Lucilia spp, Calliphora spp and Musca domestica were visiting pests of the dried fish sampled. D. maculatus was the dominant resident pest accounting for 57.07 % of the collected arthropods while Necrobia rufipe was next in importance, accounting for 21.54 %. The pests were identified using keys and voucher methods.

Keywords: Arthropod pests, Visiting pest, Resident pest, Dried fish, Cod, Fish bone, Urban market

INTRODUCTION

Fish is among the cheapest source of animal protein in Africa (Nwuba *et al.*, 2004). Dried fish is a highly favoured item of many traditional dishes in Nigeria because of its high proteinous content which is more than fresh fish and other animal proteins like egg, meat and milk. Dried fish is often a good alternative to fresh fish which is readily available in many inland communities because of improved transportation, preservation methods along with growth in inland aquaculture.

Arthropod pests commonly found on dried fish are beetles (Coleoptera), flies (Diptera) and mites (Acarina) (FAO, 1989). In Nigeria, species like *Calliphora*, *Chrysomia*, *Lucillia* and *Musca* (Diptera), *Dermestes* and *Necrobia* (Coleoptera) has been reported as pests of dried fish (Osuji, 1985). Furthermore, *Lasioderma serricorne* has been reported as a pest of dried fish in South Asia (FAO, 1989) and Lardoglyphid (mites) notably *Lardoglyphus konoii*, *Suidasia medamensis* and *Tyrophagus* spp have been reported as pest of dried fish (Osuji, 1985; Busvine, 1980; FAO, 1989) from different parts of the tropics.

Pest of foodstuffs, according to Busvine (1980) can be grouped into visiting pests and resident pests. The former lives within the building or even outside and make journeys to visit the foodstuffs, these include cockroaches, ants and flies. The latter lives and breed in the stored food. They include beetles, moths, mites and flies (Busvine, 1980).

Drying is one of the most popular means of preserving and storing fish. However, drying of fish does not guarantee the ends to the problems of

preservation, storage and distribution of fish. Dried fish can suffer considerable loss of weight due to feeding damages by insects and mites. Under adverse condition quantitative losses of up to 30 % due to fly damage during processing and up to 50% due to beetle damage during storage have been reported (FAO, 1989). In addition, infestation of dried fish by insects and mites in dried fish may cause public health hazard as they are transmitters of diseases causing pathogens to man that may lead to intestinal disorders and allergies (Busvine, 1980; Osuji, 1985). Dermestid beetles are associated with the spread of anthrax in some countries, whereas mites are known to cause itching and dermatitis (Busvine, 1980). Furthermore, flies which often perch on dried fish have been implicated as vectors of pathogens causing severe enteric disorders such as dysentery, cholera etc (Busvine, 1980). Contaminants of insect origin in foodstuffs usually lead to complaints and sometime legal action resulting in levies and loss of good will for a business (Osuji, 1985)

Hence, a systematic survey of the various arthropods infesting dried fish in Ogige market will be of immense benefit to both sellers and consumers of dried fish in Nsukka. This paper therefore aims at identifying the various arthropods infesting dried fish in Ogige market, Nsukka metropolis, and the extent of damages caused by each of the identified pest.

MATERIALS AND METHODS

Study Area: Ogige market is located in Nsukka metropolis, Enugu State, in southeast geopolitical zone of Nigeria. It is a centre of palm oil trade blessed with the first Nigerian University, the University of Nigeria, commercial banks, hospitals,

Table 1: Resident arthropod pests of dried fish and fish by product in Ogige market, Nsukka, Nigeria

Fish and Fish by product	Arthropod Pest									
	<i>D. maculatus</i>		<i>N. rufipes</i>		<i>L. konoii</i>		<i>T. castaneum</i>		<i>T. saxatile</i>	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
<i>Synodontis</i>	72	9.7	23	9.7	6	7.1	-	-	-	-
<i>Hemisynodontis</i>	40	5.3	11	4.6	3	3.6	-	-	-	-
<i>Oreochromis</i>	100	13.5	38	16.0	15	17.9	6	6.2	-	-
<i>Hepsetus</i>	66	8.9	18	7.6	20	23.8	-	-	-	-
<i>Gymnarchus</i>	22	3.0	13	5.5	2	2.4	-	-	-	-
<i>Labeo</i>	81	11.0	25	10.5	5	6.0	-	-	-	-
<i>Protopterus</i>	77	10.0	15	6.3	10	11.9	3	3.1	-	-
<i>Heterobranchus</i>	65	8.8	22	9.3	12	14.3	-	-	-	-
<i>Alestes</i>	70	9.4	32	13.5	8	9.5	-	-	2	100
<i>Heterotis</i>	10	1.4	33	13.9	3	13.6	-	-	-	-
Cod (Apama)	15	2.0	-	-	-	-	-	-	-	-
Cod (cod)	4	0.5	-	-	-	-	-	-	-	-
Heap of Bone	120	16.2	7	3.0	-	-	88	90.7	-	-
Total	742	100	237	100		100	97	100	2	100

Table 2: Visiting arthropod pests of dried fish and fish by product in Ogige market, Nsukka, Nigeria

Fish and Fish by product	Scientific name of pest	Common name of pest	Total no of times visited	% visitation
<i>Synodontis</i>	<i>P. americana</i>	Cockroach	28	25
<i>Oreochromis</i>	<i>Lucilia</i> spp	Green bottlefly	16	72.7
<i>Hepsetus</i>	<i>P. americana</i>	Cockroach	23	20.4
<i>Gymnarchus</i>	<i>Calliphora</i> spp	Blowfly	10	32.3
<i>Labeo</i>	<i>Calliphora</i> spp	Blowfly	6	19.4
<i>Protopterus</i>		Cockroach	23	20.4
<i>Hemisynodontis</i>	<i>Calliphora</i> spp	Blowfly	15	48.1
<i>Heterobranchus</i>	<i>Lucilia</i> spp	Green bottlefly	6	27.3
<i>Alestes</i>	<i>P. americana</i>	cockroach	10	8.8
<i>Heterotis</i>	<i>P. americana</i>	cockroach	27	24.0
Cod (Apama)	<i>Musca domestica</i>	Housefly	77	48.7
Cod (cod)	<i>Musca domestica</i>	Housefly	81	51.3

schools and network of transportation and communication systems. The town has an estimated population of 167,086 and is blessed with beautiful vegetation dotted with several soft green hills and a cool temperate-like weather. Dry fish supplies to the market are from various sources which include: Maiduguri, Borono State through Ose market Onitsha for *mangara* (cut smoked dried fishes), Oron in Akwa Ibom State and Otuocha/Onitsha in Anambra State for *azu nkponku* (smoked dried fishes) and Aba in Abia State for *okporoko* (dried cod fish).

Dried Fish Sampling: Samples of different types of dried fish sold in Ogige market, Nsukka, were purchased from different fish stalls; each fish sample was sealed in a polythene container and numbered serially. Fish samples were identified to generic level using Olaosebikan and Raji (1998). The fish samples were later analyzed in the Entomology laboratory, University of Nigeria, Nsukka.

Each of the dried fish samples was exposed on an illuminated surface where they were visually examined with the naked eyes and in turn with a magnifying lens in accordance with Osuji (1985) and FAO (1989). The arthropods that wriggled out of the dried fishes were collected in separate containers and

analyzed in the laboratory. Finally, the dried fish samples were cracked to make sure that no arthropod residing in the fish was left out. In addition the dried fish samples were combined together in a container and exposed around dwelling houses where they were closely monitored for two hours. Arthropods flying around or perching on the fish were caught with insect nets (FAO, 1989). The arthropods caught were separated into species, counted and analyzed in the laboratory.

Sampling for nocturnal visiting arthropods was carried out by exposing the fish in a fish stall / store where they were surrounded by a water trap (tray containing water). The set-up was examined in the morning and arthropods caught were collected in containers and analyzed in our laboratory.

Alternate sampling of diurnal and nocturnal visiting arthropods were carried out for two months exposing the fish once every week as described above and the number of different species collected noted as the fish deteriorates.

Collected arthropods were killed and examined thoroughly according to FAO (1989). With the aid of vouchers specimens in the Museum of Natural History, University of Nigeria and relevant taxonomic keys (Bristowel, 1958; Youdeowei, 1977;

Busvine, 1980; Borro *et al.*, 1981; Osuji, 1985; FAO, 1989; Nayar *et al.*, 1992) all arthropods were identified to species level.

RESULTS

The survey revealed that a total of nine different arthropods infested dried fish in Ogige market, Nsukka. Five of these were resident pest, while the remaining four were visiting pests. *Demestes maculatus* had the largest number of pest of 120(16.2%) in heap of fish bones, followed by *Oreochromis* sp (100 pest = 13.5%) (Table 1). The lowest infestation of *D. maculatus* was found in cod 4(0.5%). *Necrobia rufipes*, highest infestation occurred in *Oreochromis* sp (38 pest = 16.0%), followed by *Heterotis* sp (33 pest = 13.9%) and the lowest *N. rufipes* infestation occurred in the heap of fish bones (7 pest = 3.0%) (Table 1). *Lardoglyphus konoii* had the highest infestation in *Hepsetus* sp (20 pest = 23.8%), followed by *Oreochromis* sp (15 pest = 17.9%). The lowest rate of *L. konoii* infestation was seen in *Hemisynodontis* and *Heterotis* sp both having 3(3.6%) respectively. *Tribolium castaneum* infestation was rear in the fish genera attacking only two fish species (*Oreochromis* 6 pest = 6.2% and *Protepterus* 3 pest = 3.1%) (Table 1). Furthermore, *T. castaneum* was seen more in the heap of fish bones 88(90.7%). *Theridon saxatile* infestation was almost absent except for the *Alestes* sp where only 2 pest were seen.

The visiting pest of dried fish sold in Ogige market included; *Musca domestica* (house-fly), *Lucilia* sp (green bottle fly), *Calliphora* sp (blow fly) and *Periplanata americana* (cockroach). From this list, three of this pest were diurnal while only one (*P. americana*) was a nocturnal pest (Table 2). The rate of visitation of nocturnal pest was more on fish species like *Synodontis*, *Hepsetus*, *Protepterus* and *Heterotis*, while the diurnal pest was more in Cod (Table 2). Even though *P. americana* visited other fish genera; *Synodontis* and *Heterotis* species had the highest visitation (25.0 and 24.0 % respectively). On the other hand, Cod was visited mostly by *Musca domestica*. The blowfly visitation was more on *Hemisynodontis* sp (48%) and lowest on *Labeo* sp (19.4%). However, *Lucilia* sp visited only 2 fish genera; *Heterobranchus* and *Oreochromis*, with *Oreochromis* having the largest number of visitation (72%).

DISCUSSION

Despite that fish on sale in fish stall were heaped together (except cod) it had been observed that fish specimen taken from the same fish heap showed variation in the type of arthropods infesting them. This was in line with the findings of Osuji (1974) and Busvine (1980). In an earlier survey of smoked dried fish in Dugbe market, Ibadan, Nigeria, Osuji (1974) showed that 12 genera of dried fish were sold in the market of which 7 genera (*Heterotis*, *Heterobranchus*, *Oreochromis*, *Hepsetus*, *Synodontis*, *Labeo* and *Alestes*) were also on sales in Ogige

market in Nsukka, Nigeria. In Dugbe 71.5% of the observed infestation was *D. maculatus*, while *N. rufipes* was next in importance accounting for 28.0% (Osuji, 1974). Our report compares favourably with that of Osuji in that 57.07% of the collected arthropods from dried fish from Ogige market were *D. maculatus* and 21.54% *N. rufipes*. In addition to *D. maculatus* and *N. rufipes*; *T. castaneum*, *Trogoderma granarium* and mites were found infesting dried fish in Dugbe market. *T. granarium* was not recorded for dried fishes from Ogige market, Nsukka. Apart from infestation of dried fish, *D. maculatus* has been reported as pest of carcasses, meat, hides and skin and other dead animal (Busvine, 1980; Nayar *et al.*, 1992).

Osuji (1985) reported that *N. rufipes* has been less commonly reported in association with dried fish which is in contrast with our finding where *N. rufipes* was the major pest of *Oreochromis* sp. *N. rufipes* was reported as occasional pest of dried fish in India and Senegal, while in Malaya and Kenya, it was reported to be an exclusive pest of copra. In USA, it was reported to be infesting bacon and smoked pork. It has also been known to be pest of bones, hides and skin, palm kernel, cocoa, beans and groundnut (FAO, 1989).

The visiting arthropod pest *Lucilia* sp, *Calliphora* sp, *M. domestica* and *P. americana* found infesting dried fish in Ogige market was in line with FAO (1989). An interesting finding from this research work is the observation of a spider sp (*Theridion saxatile*) residing in *Alestes* sp. However, the exuvia of the spider was found in the fish suggesting that it has been residing in the fish for more than one month. Furthermore, *D. maculatus*, *N. rufipes* and *L. konoii* still resided in the *Alestes* sp suggesting that *T. saxatile* may not prey on these other pest. The research revealed that *Heterotis* sp was least infested with *D. maculatus* and since *D. maculatus* is a well known pest of dried fish, *Heterotis* fish is best suited for dried storage.

REFERENCES

- AMEH, G. I. and OKEZIE, C. E. A. (2005). Pests and diseases of African yam bean, *Sphenostylis stenocarpa* (Hoechst Ex. A. Rich) Harms. *Bio-Research*, 3(1): 14 – 20.
- BORRO, O. J., DELONG, D. M. and TRIPLEHORN, C. A. (1981). *An introduction to the study of insects*. Fifth Edition. Sounder College Publishers, New York.
- BRISTOW, W. S. (1958). *The world of spiders*. First Edition. Wilmer Brothers and Haram Limited, Birkenhead, London.
- BUSVINE, J. R. (1980). *Insect and hygiene. The biology and control of insects of medical and domestic importance*. Third Edition, Chapman and Hall, London.
- FAO (1989). *A field guide to the types of insects and mites infesting cured fish*. Corporate Document Repository, Food and Agricultural Organization, Geneva.

- NAYAR, K. K., ANANTHAKRISHNAN, T. N. and DAVID, B. V. (1992). *General and applied entomology*. Ninth Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, India.
- OLAOSEBIKAN, B. D. and RAJI, A. (1998). *Field guide to Nigerian freshwater fishes*. Federal College of Freshwater Fisheries Technology, New Bussa.
- OSUJI, F. N. C. (1974). Beetle infestation in dried fish purchased from a Nigerian market with special reference to *Dermestes maculatus* and *Necrobia rufipes*. *Nigerian Journal of Entomology*, 1: 69 – 79.
- OSUJI, F. N. C. (1985). *Outline of stored products Entomology for the tropics*. First Edition. Fourth Dimension Publishers, Enugu, Nigeria.
- YOUDEOWEI, A. (1977). *A laboratory manual of entomology*. First Edition. Oxford University Press, Nigeria.