

SURVEY OF EDIBLE FOREST INSECTS UTILIZED BY THE PEOPLE IN SOUTH WEST NIGERIA

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ABSTRACT

This study was conducted to take inventory of edible forest insects and evaluate their contributions to the livelihood of the people of southwest Nigeria. Multi-stage sampling technique was used to select three states (Lagos, Ogun and Kwara). Four towns were selected in each of the states while five respondents were randomly selected from each town. Sixty (60) Pre-tested semi-structured questionnaire was administered to selected respondents in the study area. Data collected were analyzed using descriptive statistics. The study showed that majority of the respondents are married (53.4 %), female (61.7 %) with (75 %) having at least secondary education. The study also revealed that 10 different insects were collected and utilized for various purposes by the respondents with *Macrotermes bellicosus* and *Apis mellifera* being the most sort after insects, (18.2 %) each, while 66.7 % of the respondents collect/harvest their products during raining season mostly by hunting (30.1 %). Majority (70.7 %) of the respondents generate over ₦20,000 from sales of edible insects annually, while 21.5 % of the respondents opined that seasonal availability and irritating physical structure are the major constraints militating against the consumption of edible insects in the study area. Avoiding deforestation and indiscriminate forest fire were the major conservation measures suggested by the respondents. It was recommended that government should enforce legislation against bush burning and illegal felling of trees.

Keywords: Survey, Forest, Edible insect, Conservation, Nigeria.

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INTRODUCTION

Forests form an integral part of life on earth, providing a wide range of benefits at local, national, and global levels. Over the years, the role of forest ecosystems in the provision of both wood and non-wood products has been recognized by rural communities. In addition to timber production which is the primary product from the forest, other important non-wood products gotten from the forest include various vegetables, fruits, mushrooms, and edible insects. (Adeduntan and Bada 2004). Several works have been carried out on various non-wood forest products in recent times. However, there tends to be less awareness in the potential of forest insects as sources of food in addition to their fundamental role in plant pollination (Stack *et al.*, 2003).

The growth in human population coupled with the inadequate supply of balanced diet that is lacking in protein is a big challenge to human health that calls for urgent solution. The provision of alternative protein sources such as edible insects to supplement animal meat and fish is one way by which this problem can be addressed. The committee on world food security stated that food security exists when all people at all times have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for active and healthy life (WHO, 2014). Insect meals can replace scarce animal protein as they contain adequate quality protein and high content of unsaturated fatty acids and minerals such as iron and zinc (DeFoliart, 2002).

Considering forest insects as food helps in manipulating forest vegetation as it puts less strain on the environment because cultivating insects require forests to be preserved rather than felled. Despite the importance of insects as food, biodiversity and conservation efforts have focused mainly on other non-wood forest products, ignoring the vast world of insects. Insects are traditional foods in many cultures, playing an important role in human nutrition and have much nutrient to offer (Ramos-Elorduy, 2005). They can be reared for their high nutritional qualities and sold to the populace that regards them as

delicacies (Banjo *et al.* 2006). Insects are considered to be a substantial source of protein than those in most plants and commercial meat, fowl, and eggs (Xiaoming *et al.*, 2010).

The impact of insects on tree health and on the forest ecosystem in general is also significant enough to yield a wide range of forest management options to address both local food needs and forest ecosystem health and productivity. The utilization of edible insects among the rural populace is constrained by the lack of social acceptance, nutritional knowledge, and disbelief about their delicacies. Therefore, this study is conducted to provide information on commonly eaten forest insects in South-west Nigeria and their contribution to the livelihood of the people in the area with the aim of documenting information therefrom for posterity.

METHODS

Study areas

The study area covers Lagos, Ogun, and Kwara States in South-west Nigeria (Figs. 1-3). This area is characterized by a tropical climate and has three distinct vegetation belts, namely: High forest, rain forest, and derived savannah, respectively. This marked ecological diversity and climatic contrast make the chosen states to be endowed with abundant edible forest insects and commercial edible insect trade is also prominent in the States. The study area lies between Latitude 6°23'20" N in Lagos State to 10°12'40" N in Kwara State and Longitude 2°36'0"E in Lagos State to 6°34'20"E in Kwara State. The diurnal temperature ranges around 26°C. Moreover, the climate is of West African monsoonal type with dry and wet seasons. The dry season normally starts from November through March and is characterized by the dry cold wind of harmattan, while the rainy season normally starts from March through October with occasional strong wind and thunderstorms, usually at the onset and the end of the rainy season. The annual rainfall ranges from 750 mm in the Northern zone to 1800 mm in the Southern zone, diurnal temperature ranges from 21°C to 31°C with little variation throughout the year. The annual average relative humidity is about 90% at 7.00 am and 65% at 4.00 pm.

Sampling procedure, data collection, and analysis

Multi-stage sampling technique was used in the study. The first stage involves a purposive selection of three States (Lagos, Ogun, and Kwara) to cut across three ecological zones. Four towns were selected in each State. Five marketers were randomly selected from the main markets of

the selected towns to make up a sample size of 60 respondents (Table 1). Pre-tested questionnaires were administered to the respondents. Administration of questionnaire was by personal interview since few of the respondents cannot read and write. This method affords the total retrieval of the questionnaire for analysis. Data collected from questionnaires were analyzed using descriptive statistics of frequency and percentage.

RESULTS

Socioeconomic characteristics of the respondents

The result in Table 2 revealed that 61.7% of the respondents are female, 61.7% are within the age bracket of 31–50 years while 53.4% are married. Majority (75%) of the respondents have at least secondary education while 70.0% have family size of at least four members.

Common edible forest insects and their uses in the study area

Table 3 shows that 10 different insects are consumed and utilized by the respondents in the study area with *Apis mellifera* and *Macrotermes bellicosus* being the most sort after insects (18.2%) each. Other insects with high demand are *Rhynchophorus phoenicis* (12.1%), *Cirina forda* (11.5%), and *Anaphe venata* (11.2%). Table 4 revealed various uses of these insects by respondents to include: Spices, food, delicacy, medicinal, and cultural purposes among others.



Fig. 1: Maps of Lagos state

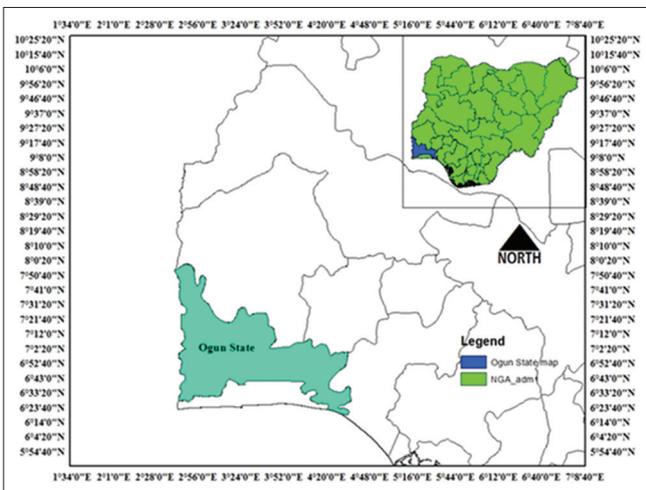


Fig. 2: Map of Ogun state

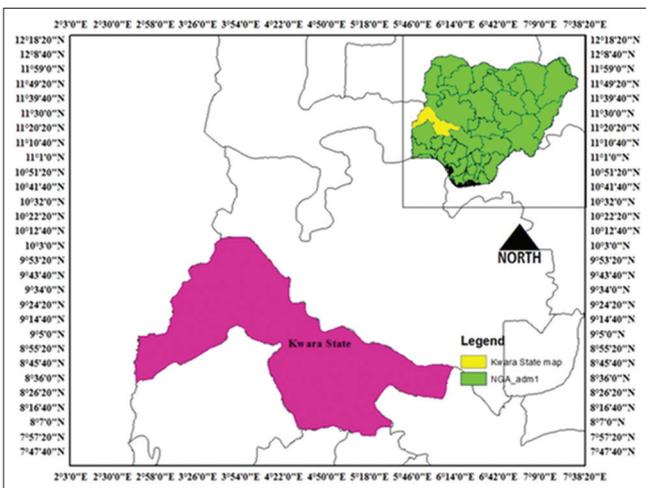


Fig. 3: Map of Kwara state

Table 1: Distribution of respondents in the study area

States	Town	No of respondents
Lagos	Ikorodu	5
	Imota	5
	Agbowo	5
Ogun	Epe	5
	Sango	5
	Abeokuta	5
Kwara	Itokin	5
	Oke-Aje	5
	Amoyo	5
Total 3	Ganmo	5
	Ajase -Ipo	5
	Offa	5
	12	60

Table 2: Socioeconomic characteristics of the respondents

Variables	Frequency	Percentage
Gender		
Male	23	38.3
Female	37	61.7
Age		
<30	8	13.3
31–40	13	21.7
41–50	24	40.0
51–60	5	10.0
61 and above	9	15.0
Marital status		
Single	15	25.0
Married	32	53.4
Divorced	8	13.3
Widowed	5	8.3
Educational		
Non-formal	11	18.3
Primary	4	6.7
Secondary	26	43.3
Tertiary	19	31.7
Family size		
1–3	18	30
4–6	32	53.3
>7	10	16.7
Total	60	100

Table 3: Common forest edible insect in the study area

Common name	Scientific name	Order	Family	Local Name	Freq.	Percentage
Honey bee	<i>Apis mellifera</i>	Hymenoptera	Apidae	Oyin	60	18.2
Palm Beetles	<i>Oryctes rhinoceros</i>	Coleoptera	Scarabaeidae	Opopoluo	18	5.5
Palm beetle (larvae)	<i>Oryctes rhinoceros</i>	Coleoptera	Scarabaeidae	Ogongo	32	9.7
Caterpillars	<i>Cirina forda</i>	Lepidoptera	Notodontidae	Kanyin	38	11.5
Crickets	<i>Brachytrupes membranaceus</i>	Orthoptera	Gryllidae	Ire	28	8.5
Grasshoppers	<i>Zonocerus variegatus</i>	Orthoptera	Pyrgomorphidae	Tata/Elete	10	3.0
Termites	<i>Macrotermes bellicosus</i>	Isoptera	Termitidae	Esunsun	60	18.2
Palm weevil	<i>Rhynchophorus</i> <i>Phoenics</i>	Coleoptera	Curculionidae	Itun	40	12.1
Caterpillars	<i>Anaphe venata</i>	Lepidoptera	Notodontidae	Aporuku	37	11.2
Rhinocerus beetle	<i>Analeptes trifasciata</i>	Coleoptera	Scarabacidae	Paripa	7	2.1
Total	10				330*	100

*Multiple responses

Table 4: Uses of edible forest insect

Local name	Scientific name	Uses
Oyin	<i>Apis mellifera</i>	Sweetener, medicinal, defense, cultural, and wax
Opopoluo	<i>Oryctes rhinoceros (beetle)</i>	Spice, delicacy, and food
Ogongo	<i>Oryctes rhinoceros (larvae)</i>	Spice, delicacy, and food
Kanyin	<i>Cirina forda</i>	Spice, delicacy, and food
Ire	<i>Brachytrupes membranaceus</i>	Spice, delicacy, food, and play by children
Tata/Elete	<i>Zonocerus variegatus</i>	Spice, delicacy, and food
Esunsun	<i>Macrotermes bellicosus</i>	Spice, delicacy, food, and cultural
Itun	<i>Rhynchophorus phoenicis</i>	Spice, delicacy, and food
Aporuku	<i>Anaphe venata</i>	Spice, delicacy, food, and silk
Paripa	<i>Analeptes trifasciata</i>	Spice, delicacy, and food

Respondents' methods of collection and processing

The result in Table 5 revealed that 44.1% of respondents collect their product from the forest followed by farmland (30.1%) while 34.4% and 28.6% of respondents collect/harvest their product by hunting and handpicking, respectively. Most (46.7%) of the respondents opined that collection was easy and that the insects are mostly available in the rainy season (66.7%) while roasting accounted for 30.0%, of the respondents' processing method followed by boiling (25%) (Table 6).

Economic contribution of edible forest insects in the study area

Table 7 shows that 61.7% of the respondents have between 11 and 15 years of marketing experience, 46.2% of the respondents sold their collections by bits (Table 8), while 46.7% of the respondents generates over ₦30,000.00 from sales annually (Table 9).

Constraints to edible forest insect's consumption in the study area

Table 10 shows that 21.5% of the respondents opined that seasonal availability and irritating physical structure, respectively, are the major constraints militating against the consumption of edible insects in the study area. Other constraints mentioned include poor supply (17.6%), cultural belief (15.0%), and small size nature (13.3%).

Suggested measures for conservation of edible insects

The result in Table 11 shows conservation measures suggested by the respondents with avoiding deforestation and indiscriminate forest burning accounted for 34.3% and 32.0%, respectively.

DISCUSSION

The observed high percentage of involvement of married female respondents in the business of edible forest insects attests to the fact that women have always been found to play a significant role in the collection and marketing of non-timber forest products in the

Table 5: Distribution of respondents by sources of collection

Variables	Frequency	Percentage
Source		
Forest	60	44.1
Farmland	41	30.1
Environment	23	17.0
Reared	12	8.8
Total	136*	100
Collection methods		
Net trapping	12	7.8
Hunting	53	34.4
Hand-picking	44	28.6
Catching	30	19.5
Smoking	15	9.7
Total	154*	100
Supply		
Very easy	14	23.3
Easy	28	46.7
Difficult	12	20.0
Very difficult	6	10.0
Total	60	100
Season		
Rain	40	66.7
Dry	12	20.0
All year round	8	13.3
Total	60	100

*Multiple responses

Table 6: Distribution of respondents by methods of processing

Methods of processing	Frequency	Percentage
Roasting	54	30.0
Frying	42	23.3
Boiling	45	25.0
Sun drying	39	22.2
Total	180*	100

*Multiple responses

Table 7: Distribution of respondents by marketing experience

Marketing experience	Frequency	Percentage
<5 year	5	8.3
6-10 years	12	20.0
11-15 years	37	61.7
>15 years	6	10.0
Total	60	100

study area. This assertion had similarly been reported by Olujobi and Olajuyigbe (2020). The study also revealed that edible forest insect as a non-timber forest product contributes immensely to the socioeconomic

Table 8: Distribution of respondents by mode of selling

Mode of selling	Frequency	Percentage
Bit	60	46.2
Kongo	48	36.9
Weighing	22	16.9
Total	130*	100

*Multiple responses

Table 9: Distribution of respondents by annual sales

Sales (₦)	Frequency	Percentage
<10,000	2	3.3
10,000–20,000	12	20.0
21,000–3000	18	30.0
>30,000	28	46.7
Total	60	100

Table 10: Constraints against the consumption of edible insects

Constraints	Frequency	Percentage
Cultural beliefs	35	15.0
Poor supply	41	17.6
Small size	31	13.3
Seasonal availability	50	21.5
irritating physical structure	50	21.5
Unpleasant odor	16	6.9
Edible insects contain poison	10	4.2
Total	233*	100

*Multiple responses

Table 11: Conservation measures for edible insect

Conservation measures	Frequency	Percentage
Cultivation in home gardens	15	9.0
Avoid indiscriminate burning of forest	53	32.0
Avoid the use of pesticides	41	24.7
Avoid deforestation	57	34.3
Total	166*	100

*Multiple responses

well-being of the people in the study area and also impacted positively their livelihood by meeting their economic and household needs. This assertion was evident in the wide range of the uses of edible forest insects by the respondents (Table 4) and income generated from the sales of the insects (Table 9). This submission corroborates Aiyelaja and Ajewole (2006) who reported that forest reserves provide a wide range of products for the rural population for their immediate household needs.

The involvement of mostly middle-aged people with at least secondary education in the collection/harvesting of edible forest insects is an indication that there is a high level of unemployment among the youths in the study area. This group of people is agile, strong, versatile, and full of energy. Since there is no white-collar job for them to do, they go into the forest (since most of the collections are carried out in the natural forest) to hunt for insects and other non-timber forest products. This assertion agrees with the findings of Roland and Oyelana (2014) who stated that majority of the rural household involved in non-timber forest product harvesting and collection were within the age bracket of 41–50 years.

The observed high number of forest insect species collected/harvested by the people of South-west Nigeria could be attributed to the vast area of land mass with a diverse ecosystem. This scenario provides different types of vegetation with different host plant species adaptable to different climatic conditions which favor the breeding of different

insect species, especially during the rainy season. The seasonality of the insects as observed in this study agrees with the findings of Van Huis (2013) that most insect species occur seasonally depending on the availability of their host plant.

The length of year of experience of the respondents in the collection/harvesting and utilization of edible forest insects such as *M. bellicosus*, *A. mellifera*, *R. Phoenixis*, *C. forda*, and *A. venata* being the most sort after insects species in the study area shows that edible insect's consumption has been part of the people's way of life for food, medicine, and cultural purposes. This finding agrees with the report by Kelemu *et al.* (2015) that Nigerians are known for the consumption of edible insects as an alternative source of animal protein. The ease of collection/harvesting as opined by the respondents could probably be because they often occur in clusters. This assertion has similarly been reported by Jongema (2015).

The study revealed that collections are usually processed by roasting, boiling, and frying and preserved for consumption on a later day. While the major constraints to the consumption of forest insects as observed in the study include seasonal availability and irritating physical structure, other constraints are unpleasant odor, small sizes, and cultural beliefs. Observation from the study revealed that avoiding deforestation, burning of forests and use of pesticides are some of the conservation measures suggested by the respondents in the study area. The respondents also opened that some insect species can be domesticated through the home garden.

CONCLUSION

The number of insect species harvested and utilized as recorded in this study has revealed the important role played by edible insects in the socioeconomic well-being and overall livelihood of the people of South-west Nigeria. The study revealed that insects such as *M. bellicosus*, *A. mellifera*, *R. Phoenixis*, *C. forda*, and *A. venata* are in high demand and they are mainly sourced from the wild at different times of the year. The collections are usually prepared for consumption either by boiling, frying, roasting, or sun drying, while consumption of these insects was constrained by seasonal availability and irritating physical structure and unpleasant odor among others.

RECOMMENDATIONS

In light of the socioeconomic significance of the edible forest insect to the livelihood of the people in the study area, it is recommended that government should enforce legislation against bush burning and illegal tree felling. Also, government should encourage the establishment of plantation of indigenous tree species and promote the rearing of these insects by domestication through the home garden.

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