

UTILIZATION OF EDIBLE WINGED TERMITE (*Macrotermes natalensis*) IN SELECTED COMMUNITIES OF IMO AND RIVERS STATES, NIGERIA

Ijeomah, H. M., Oyebade, B.A. and Mazi, E.C.

ABSTRACT-*Macrotermes natalensis* is an age – old delicacy in many homes and highly cherished by children and rural dwellers who eat it as a snack, but factors militating against their availability and utilization in the study area are yet to be documented. This study investigated various ways of utilizing the species in the study area, effects of demographic characteristics of respondents on utilization of the species, perception of people concerning utilization of the species, and factors militating against the availability, harvesting and utilization of the species in the study area. Data for this study were collected through a set of questionnaires which was complimented with in-depth interviews. Data obtained were analyzed using descriptive statistics in the form of percentages, tables and charts while Chi-square was used to test for associations. Consumption of edible winged termites in the study area is not significantly associated ($p>0.05$) with sex of the respondents ($\chi^2=0.227a$), age ($\chi^2=8.945a$), marital status ($\chi^2=1.526a$), occupation ($\chi^2=13.369a$), household size ($\chi^2=10.692a$), ethnic background ($\chi^2=0.887a$) and educational level of respondents ($\chi^2=16.396a$). *Macrotermes natalensis* is consumed by most respondents in the study area. Consumption of the species is increasing in Ezi-orsu (90.0%) and Opuoma (80.4%) which are rural communities where its consumption was previously forbidden but is decreasing in an urban area, Rumuokwuta (87.5%) and a suburban area, Choba (66.7%); where its utilization was never abhorred by culture. Season was implicated by most respondents as the limiting factor to the availability and utilization of the species in the study area while unavailability of light limits its harvesting. A few respondents indicated that the utilization of edible winged termite is limited by taboos. Edible winged termites are of utmost importance to the diets of rural people as a source of cheap protein especially in the study areas but the high rate of deforestation as a result of development could threaten its seasonal availability.

Keywords: Edible winged termite, wildlife utilization, animal protein, Nigeria

INTRODUCTION

Apart from timber, there are diverse and important wildlife resources from wild lands or forests. These Non- timber forest products includes mushrooms, edible fruits

Ijeomah, H. M., Oyebade, B.A. and Mazi, E.C.
Department of Forestry and Wildlife Management,
University of Port Harcourt, P.M.B.5323, Port
Harcourt, Rivers State, Nigeria.
Email: henry.ijeomah@uniport.edu.ng

and vegetable, ropes, resins, oil, honey, dye, spices, snails, medicinal plants, bushmeat and edible insects. Insects have played important but often neglected roles in the history of human nutrition among

indigenous people in Africa, Asia and Latin America; as traditional foods which they are part of, are specifically vital in alleviating food insecurity and widespread malnutrition (12; 3). The most commonly eaten insect groups include termites, beetles, caterpillars, crickets, locust, leaf and plant hoppers (6). When available (seasonally or throughout the year) these insects are incorporated in meals as part of the planned diet (16; 11). Insects are one of the cheapest source of animal protein and their consumption has been encouraged even through medical awareness because many people cannot afford meat or fish (7; 14). They are

nutritious, readily available but under-utilized in many areas. (6) has predicted that by 2050 people will have no choice but consume insects due to rapid increase in human population. Insects' consumption puts less strain on the environment because cultivating insects requires forest to be preserved rather than cleared (1).

Termites form an important part of diet of man around the world including Nigeria. They are one of the widely eaten insects in Nigeria. They are a valuable source of animal protein and essential minerals and vitamins. Termites are a large and diverse groups of insects consisting of over 2,600 species. With over 660 species, Africa is the richest continent in termite diversity (5; 15) but the utilization of this vital resources has not been maximized in the face of inherent economic hardship among indigenous people of the Niger Delta, and their daily increasing animal protein demand by the growing human population. Most studies on rural protein supply from wild resources have focused on fish and vertebrate wildlife species, which rural inhabitants prefer to sell in order to generate scarce revenue for the family than consume to balance their protein requirement.

Recently, studies on wildlife utilization are beginning to be focused on non vertebrate species. In the case of Niger

Delta region, however, emphasis is only laid on utilization of Crab, Periwinkle, Oyster and Palm weevil Larvae (Edible maggot) (10) which are common and more frequently utilized non-vertebrate wildlife species but only abundant in coastal households. Termites are among the most widely consumed insects in Nigeria but its level of utilization amongst households have not been ascertained, the factors militating against the availability, harvesting and utilization of the species especially in the Niger delta region is yet to be documented.

This study therefore aims to:

1. assess the various methods of utilizing the species in the study area
2. ascertain the effect of demographic characteristics on its utilization among the communities.
3. evaluate the perception of people concerning utilization of the species.
4. investigate the factors militating against the availability, harvesting and utilization of the species.

METHODOLOGY

Study Area

This study was carried out in Rivers and Imo states (Figure 1). Rivers state is bounded on the south by the Atlantic Ocean, to the north by Imo, Abia and Anambra States to the East by Akwa Ibom state and to the West by

Bayelsa and Delta states (16). Imo state lies longitude $6^{\circ}50'E$ and $7^{\circ}25'E$.
within latitudes $4^{\circ}45'N$ and $7^{\circ}15'N$, and

IJSER

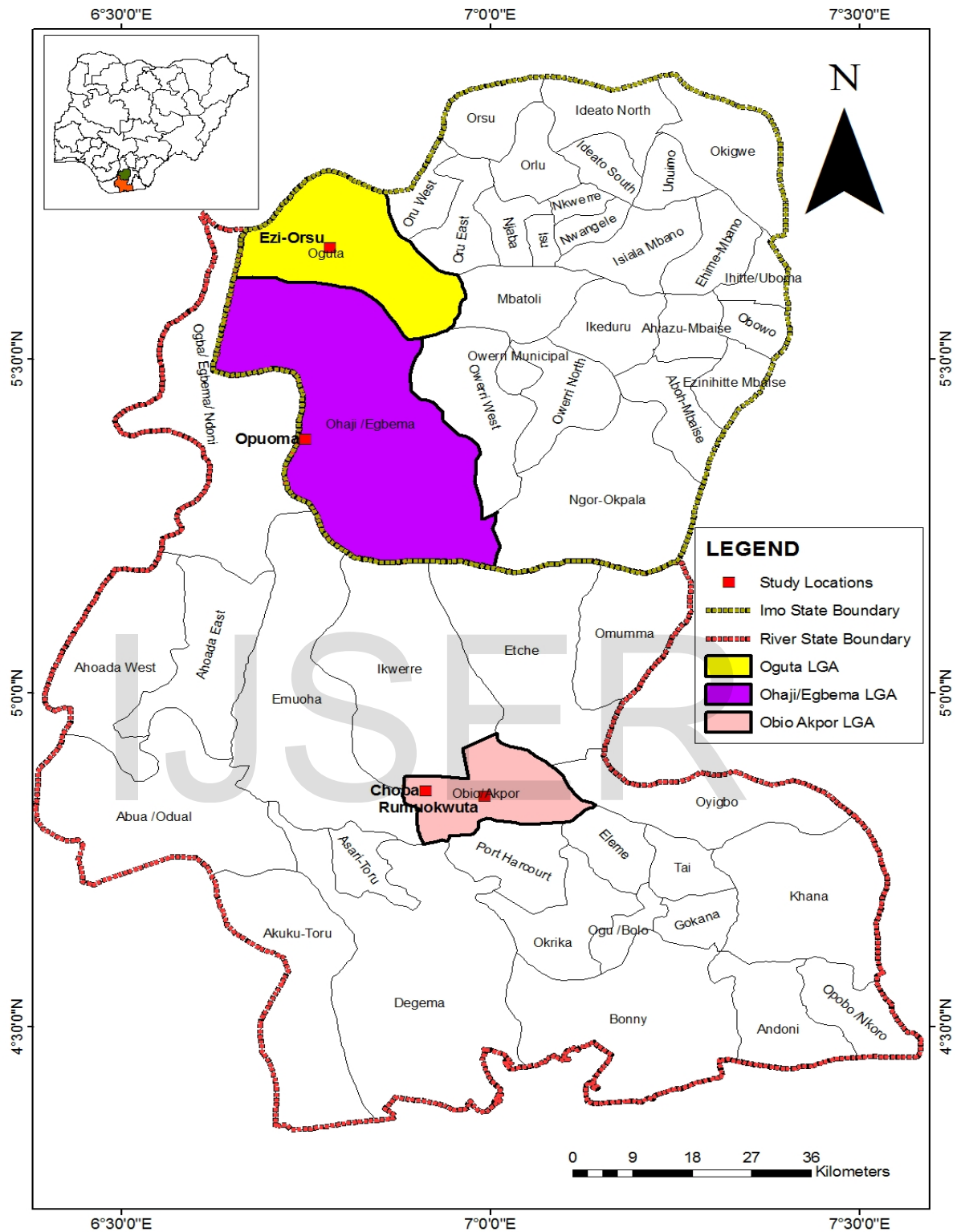


Figure 1: Map of Rivers/Imo States showing the study areas

Source: Field Survey, 2014

Sampling Technique

Rivers and Imo states were selected based on the relative abundance of edible winged termite therein. Opuoma and Eziorsu in Imo state were selected to represent rural communities while, Choba and

Rumuokwuta both in Rivers state were selected to represent suburban communities and urban communities respectively. Sixty questionnaires were allocated to each selected community as presented in Table 1.

Table 1: Allocation of questionnaire to respondents in selected communities

Communities	No. of Households	No. of questionnaire
	Sampled	Retrieved
Opuoma	60	56
Ezi-orsu	60	40
Choba	60	42
Rumuokwuta	60	40
Total number of households sampled in the four communities	240	178

Source: Field Survey, 2014

Methods of Data Collection

Data for this research project were collected through structured questionnaire which were randomly administered to household representatives as shown in Table1. Data obtained were complimented with interviews of indigenes of selected communities who have spent a minimum of ten years in the community and are quite knowledgeable about utilization of edible winged termites in the study area. A total of

240 households were sampled in the four communities being 60 questionnaires per community. However, only 178 were used.

Methods of Data Analysis

Data collected for the study were analyzed using descriptive statistics in the form of percentage, frequency of occurrence, tables and charts while Chi-square was be used to test for associations.

RESULTS

Results on Table 2 shows that majority of the respondents have consumed edible winged termite. Figure 2 reveals that the species is mostly utilized as food in the study area.

Table 2: Chi-square test of association between demographic characteristics of respondents and consumption/Utilization of edible winged termites in the study area

Parameter	Variable	Frequencies (Percentages)			
		I	II	III	IV
Have you consumed it?	Yes	47(83.9%)*	40(100%)	27(64.3%)	36(90.0%)
	No	9(16.0%)	0	15(35.7%)	4(10.0%)

*Numbers in parenthesis are percentage values

Source: Field Survey, 2014.

- I – Opuoma Community, Imo State
- II – Ezi- Orsu Community, Imo State
- III – Choba Community, Rivers State
- IV – Rumuokwuta Community, Rivers State

Chi-square tests showed no association ($p > 0.05$) between Sex of respondents and consumption of edible winged termite in the study area ($\chi^2 = 0.227^a$), age of respondents and utilization or consumption ($\chi^2 = 8.945^a$), marital Status of respondents and Consumption of edible winged termite in the study area ($\chi^2 = 1.526^a$), Occupation and consumption of edible winged termite in the

study area ($\chi^2 = 13.369^a$), household size and consumption ($\chi^2 = 10.692^a$), ethnic background of respondents and consumption/utilization of edible winged termite in the study area ($\chi^2 = 0.887^a$) and also between level of education and consumption ($\chi^2 = 16.396^a$) of the species. i.e. - all the respondents consume/utilize edible winged termites in the four communities.

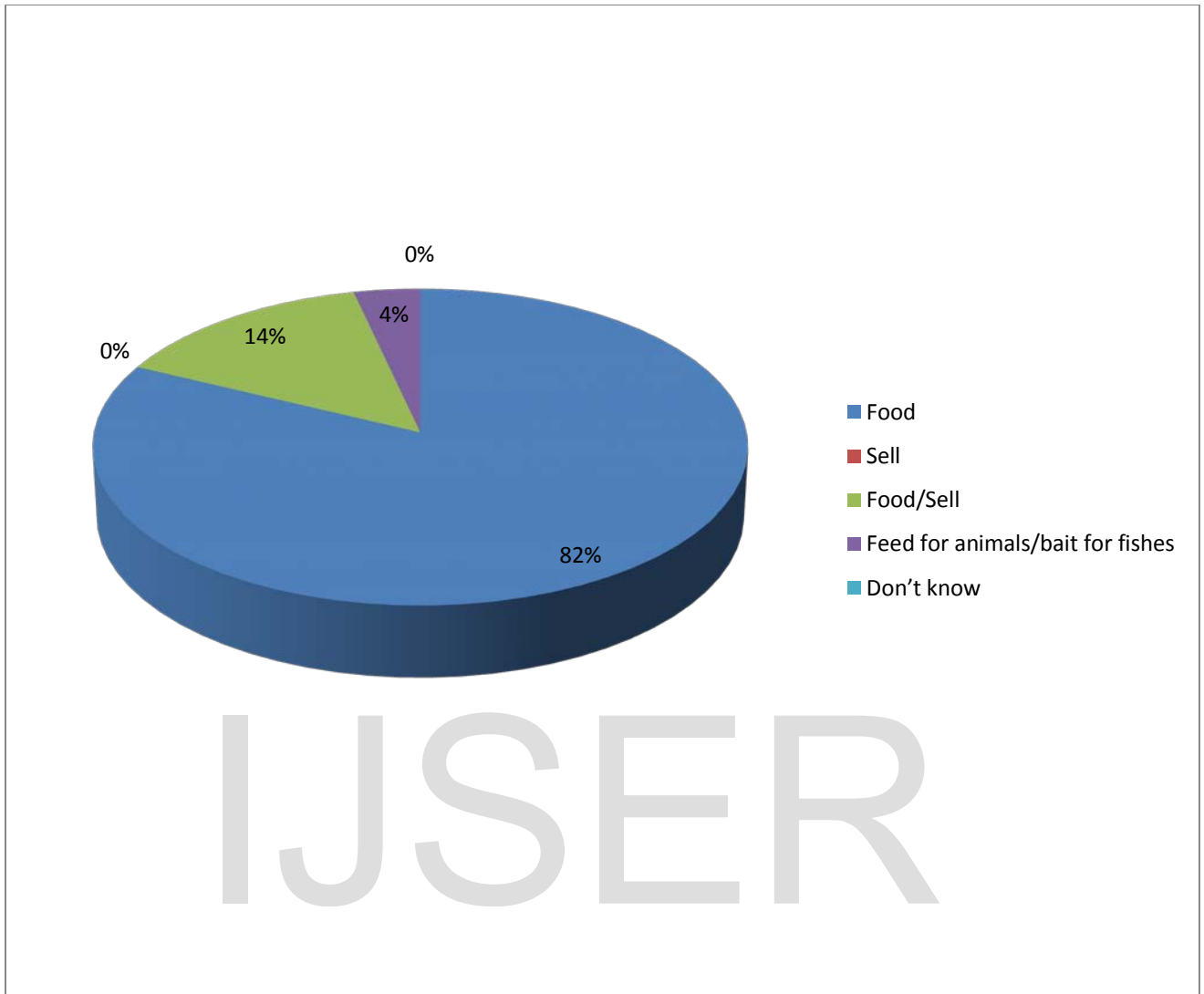


Figure 2: Method of utilizing edible winged termites in the study area

Source: Field Survey, 2014.

- I – Opuoma Community, Imo State
- II – Ezi- Orsu Community, Imo State
- III – Choba Community, Rivers State
- IV – Rumuokwuta Community, Rivers State

Perception of households towards utilization of the species in the study area

Results on perception of households towards utilization of the species are shown in tables 3 and 4. According to table 3, a greater percentage of the respondents in Ezi- Orsu (62.5%), Opuoma (46.4%), Choba (42.9%) and Rumuokwuta (30.0%) perceived the

species as snack or food; some respondents in Choba (23.8%) and Rumuokwuta (20.0%) do not like the species, while a few in Choba (21.4%) and Opuoma (10.7%) communities had no interest in the species. Table 4 shows that majority of the respondents in the four studied communities perceive consumers of the species in their areas as normal.

Table 3: Respondents’ perception of edible winged termites in the study area

Perception	Frequencies (percentages)			
	Communities			
	I	II	III	IV
Food/Snack	26 (46.4%)*	25(62.5%)	18(42.9%)	12(30.0%)
Proteineous/Nutritious	3(5.4%)	5(12.5%)	5(11.9%)	0
No interest	6(10.7%)	1(2.5%)	9(21.4%)	2(5.0%)
Taboo	3(5.4%)	1(2.5%)	5(11.9%)	4(10.0%)
Useless ants/insects	10(17.9%)	5(12.5%)	6(14.3%)	8(20.0%)
Giver of blood/strength	2(3.6%)	0	0	0
Disgusting/Irritating	2(3.6%)	0	7(16.7%)	9(22.5%)
Dislike it	10(17.9%)	6(15.0%)	10(23.8%)	8(20.0%)
Not meant to be eaten	0	0	1(2.4%)	20.0%)
Valueless	0	0	0	1(2.5%)
Medicinal insect	1(1.8%)	0	0	0

*Numbers in parenthesis are percentage values

Source: Field Survey, 2014.

- I – Opuoma Community, Imo State
- II – Ezi- Orsu Community, Imo State
- III – Choba Community, Rivers State
- IV – Rumuokwuta Community, Rivers State

Table 4: Respondents’ perception of consumers of edible winged termites from their areas in the study area

Frequencies (percentages)				
Communities				
Perceive the people as:	I	II	III	IV
Normal	43(76.8%)*	40(100%)	29(69.1%)	31(77.5%)
Consumers of strangers' food	3(5.4%)	0	3(7.1%)	0
Glutton	1(1.8%)	0	3(7.1%)	1(2.5%)
Ant/insect eaters	7(12.5%)	0	1(2.4%)	1(2.5%)
Consumers of forbidden food	0	0	1(2.4%)	2(5.0%)
Archaic/barbaric	1(1.8%)	0	1(2.4%)	0
Spiritualist/herbalist	0	0	1(2.4%)	0
Senseless	0	0	1(2.4%)	0
No idea	0	0	3(7.1%)	5(12.5%)

*Numbers in parenthesis are percentage values

Source: Field Survey, 2014.

I – Opuoma Community, Imo State

II – Ezi- Orsu Community, Imo State

III – Choba Community, Rivers State

IV – Rumuokwuta Community, Rivers State

Factors militating against availability, harvesting and utilization of edible winged termites in the study area

The major factor militating against availability of the species as indicated by all the respondents in Opuoma (100%) and Ezi-orsu (100%), and most of respondents in Choba (87.5%) and Rumuokwuta (95.0%) communities is season (Figure 3). According to table 5, many respondents in Opuoma (55.4%) and Ezi-orsu (50.0%), and some respondents in Choba (40.5%) and

Rumuokwuta (40.0%) implicated absence of light as the major factor militating against harvesting of the species in the study area. Season was indicated as the major factor militating against the utilization of the species as indicated by majority of the respondents in Ezi-orsu (85.0%) and Opuoma (71.4%), and some respondents in Rumuokwuta (45.0%) and Choba (40.5%) communities (table 6). Figure 4 shows that consumption/utilization of the species is increasing in Ezi-orsu (90.0%) and Opuoma

(80.4%) communities but decreasing in Rumuokwuta (87.5%) and Choba (66.7%) communities. Results in Table 7 show that causes of decline in the species' abundance

was attributed to civilization/development by some respondents in Choba (40.5%), Ezi-orsu (32.5%), and few in Opuoma (19.6%) and Rumuokwuta (17.5%) communities.

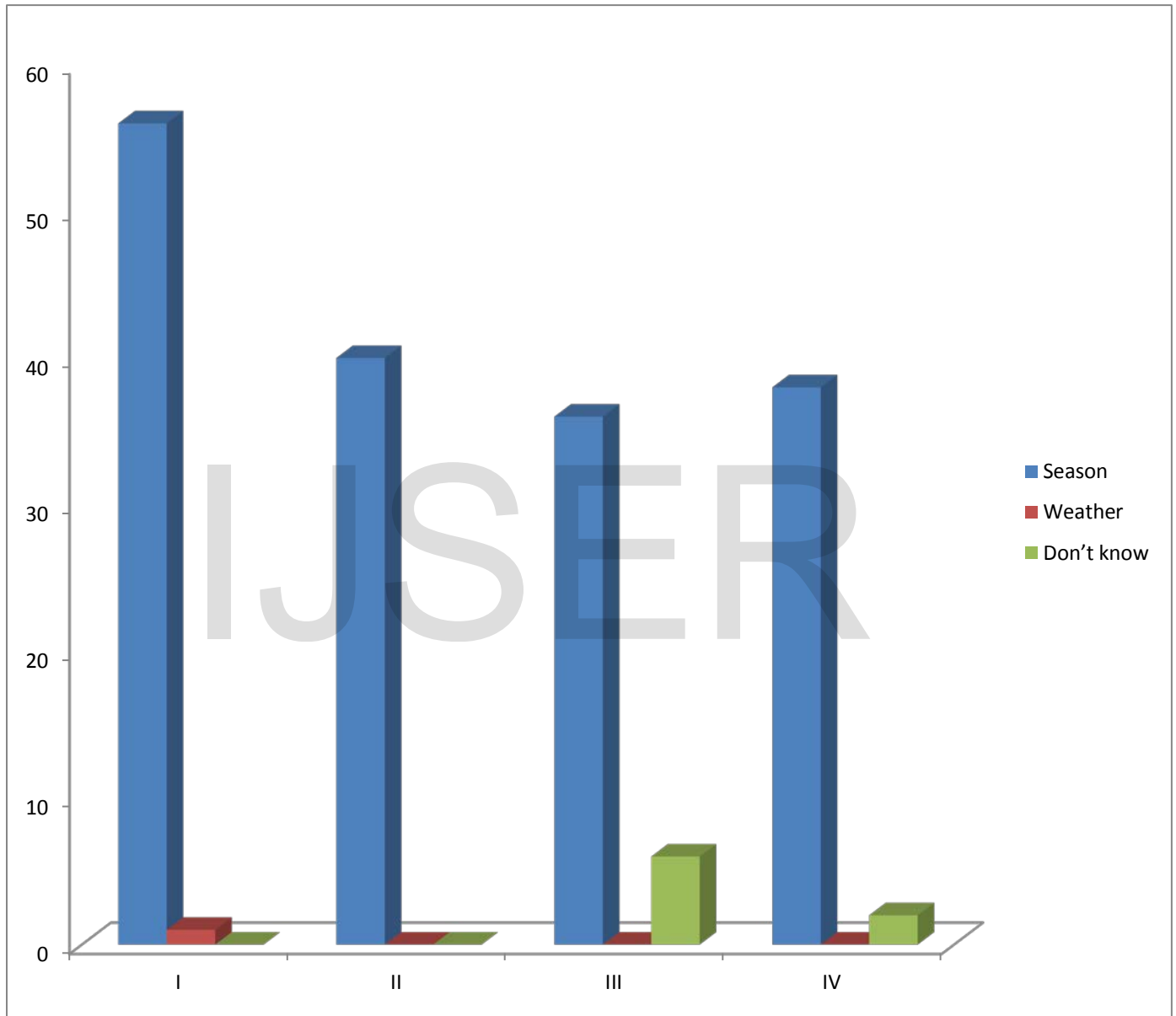


Figure 3: Factors militating against availability of the species in the study area

Source: Field Survey, 2014

I – Opuoma Community, Imo State

II – Ezi- Orsu Community, Imo State

III – Choba Community, Rivers State

IV – Rumuokwuta Community, Rivers State

Table 5: Factors militating against harvesting of edible winged termites when it is available in the study area

Factors	Frequencies (percentages)			
	I	II	III	IV
Light	31(55.4%)*	20(50.0%)	17(40.5%)	16(40.0%)
Interest	6(10.7%)	10(25.05)	1(2.4%)	1(2.5%)
Time conscious	6(10.7%)	4(10.0%)	1(2.4%)8	0
Determination	2(3.6%)	1(2.5%)	0	1(2.5%)
Laziness	7(12.5%)	5(12.5%)	0	0
Stressful	0	0	1(2.4%)	1(2.5%)
Availability	0	0	5(11.9%)	2(5.0%)
Extinction	0	0	0	2(5.0%)
Spoilage/wastage	0	0	1(2.4%)	0
Anthill	0	1(2.5%)	1(2.4%)	1(2.5%)
Climate change	1(1.8%)	1(2.5%)	1(2.4%)	1(2.5%)
Perfection	0	0	1(2.4%)	0
Perception	3(5.4%)	0	2(4.8%)	1(2.5%)
Don't know	5(8.9%)	2(5.0%)	12(28.6%)	14(35.0%)

*Numbers in parenthesis are percentage values

Source: Field Survey, 2014.

I – Opuoma Community, Imo State

II – Ezi- Orsu Community, Imo State

III – Choba Community, Rivers State

IV – Rumuokwuta Community, Rivers State

Table 6: Factors militating against utilization of edible winged termites in the study area

Frequencies (percentages)	
---------------------------	--

Communities

Factors	I	II	III	IV
Season	40(71.4%)*	34(85.0%)	17(40.5%)	18(45.0%)
Cultural factors/Taboo	6(10.8%)	6(15.0%)	10(23.8%)	8(20.0%)
Irritation	4(7.1%)	2(5.0%)	7(16.7%)	4(10.0%)
Family	1(1.8%)	0	6(14.3%)	3(7.5%)
Don't know	3(5.4%)	0	2(4.8%)	7(17.5)

*Numbers in parenthesis are percentage values

Source: Field Survey, 2014

- I – Opuoma Community, Imo State
- II – Ezi- Orsu Community, Imo State
- III – Choba Community, Rivers State
- IV – Rumuokwuta Community, Rivers State

IJSER

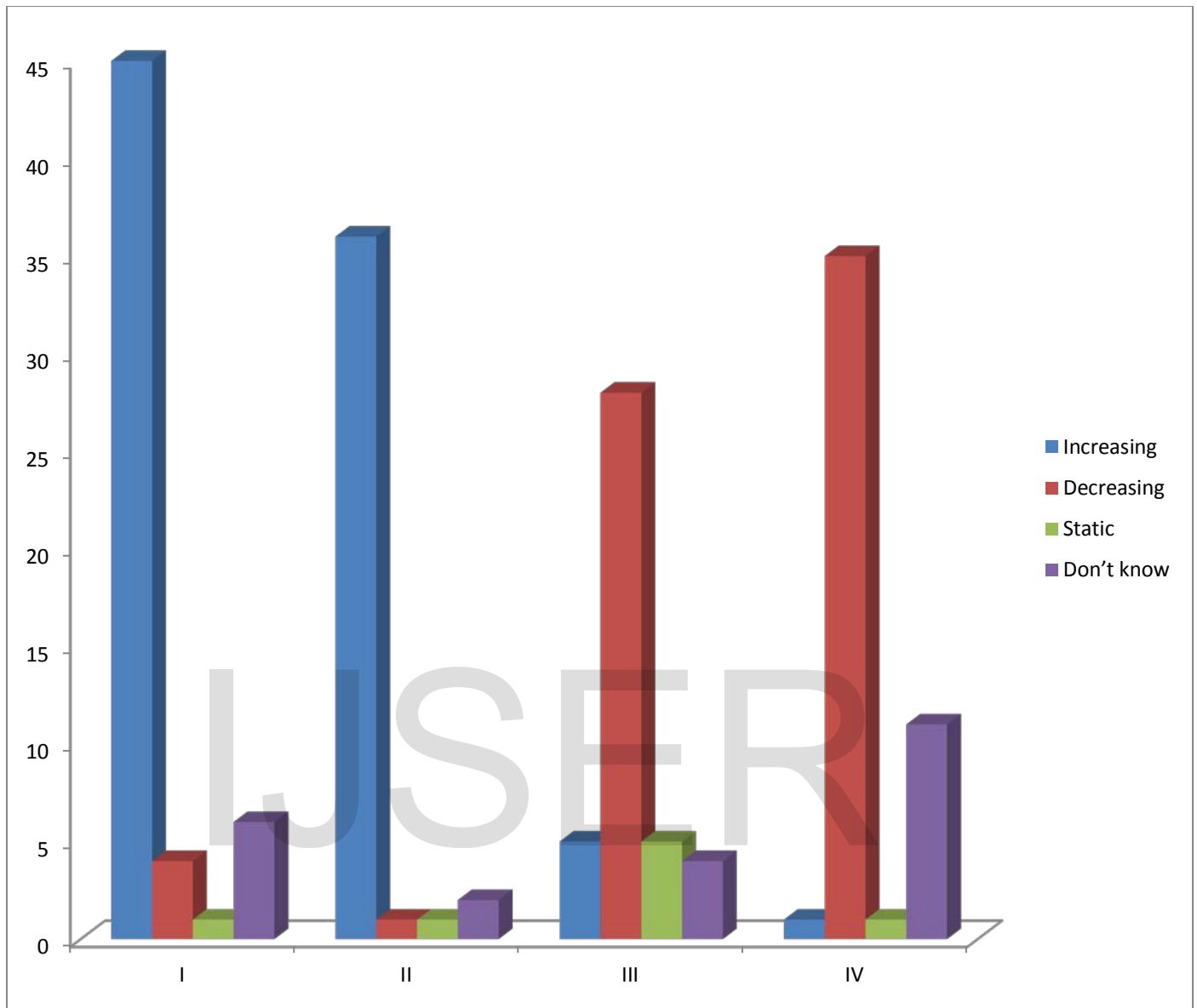


Figure 4: Perceived trend of consumption of edible winged termites in the study area

Source: Field Survey, 2014

- I – Opuoma Community, Imo State
- II – Ezi- Orsu Community, Imo State
- III – Choba Community, Rivers State
- IV – Rumuokwuta Community, Rivers State

Table 7: Distribution of respondents based on perceived causes of species decline in the study area

Causes of decline	Frequencies (percentages)			
	I	II	III	IV
Deforestation	7(12.5%)*	10(25.0%)	4(9.5%)	1(2.5%)
Climate change	5(8.9%)	8(20.0%)	1(2.4%)	9(22.5%)
Pollution	0	0	1(2.4%)	0
Chemicals/fertilizer	5(8.9%)	2(5.0%)	0	0
Civilization/development/modernization	11(19.6%)	13(32.5%)	17(40.5%)	7(17.5%)
Migration	1(1.8%)	7(17.5%)	9(21.4%)	6(15.0%)
Bush burning	5(8.9%)	8(20.0%)	0	0
Absence of anthill	3(5.4%)	1(2.5)	1(2.4%)	1(2.5%)
Human Population increase	6(10.7%)	0	5(11.9%)	2(5.0%)
Don't know	13(23.2%)	3(7.5%)	6(14.3%)	14(35.05)

*Numbers in parenthesis are percentage value

Source: Field Survey, 2014

- I – Opuoma Community, Imo State
- II – Ezi- Orsu Community, Imo State
- III – Choba Community, Rivers State
- IV – Rumuokwuta Community, Rivers State

DISCUSSION

Method of utilizing edible winged termites in the study area

The species is mostly used for food in the study area (Figure 2). This is because less value is placed on its economic or market value. Its consumptive value is well valued unlike other wildlife species such as cane rat or snail, with relatively higher economic value. It can also be attributed to the fact that it is highly perishable, seasonal or perception of individuals towards the species. Other possible reasons could not be unconnected with the fact that harvesting the species is not difficult.

The edible winged termite is consumed immediately after processing or incorporated to meals within days after its harvest. However, few respondents who utilize it as food or sell do so when the catch is large and must satisfy its consumptive utilization before taking it to the market for sale. It can also be seen as a welcome treat for large households who utilize it as food for the entire family probably because it has less market value and low monetary returns as compared with cane rat, porcupine, tortoise etc.

Similarly, the species is eaten either mixed or as part of a meal alongside African salad in Obowo community, Ideato and Mbano local government areas of Imo States and

several other eastern parts of Nigeria. The species is used as crayfish in several local delicacies according to cultural taste, fashion and differences of people and communities in Rivers and Imo States in preparing *Egusi*, vegetable and *Okra* soup. The reason is because of the local indigenous perception that the species is proteinous like crayfish and provides similar nutrients that crayfish adds to the body. This is popular among Mbaise area of Imo States and other parts of Abia and Anambra States.

Edible winged termite in grinded form is used as a substitute for crayfish in the preparation of *agbaranti*, a local delicacy, from melon in parts of Abia, Anambra and Enugu States. The species is used in local delicacies as crayfish in *moin-moin* (beans) and *Ikpa* or *Ikpa oka* (*corn meal*) but mixed with either ripe plantain (*Ikpa ipa*). One of the reasons for using edible winged termites as a substitute for crayfish can be traced to the indigenous belief in Opuoma that the species and crayfish have similar ancestry (evolution) but different in habitat as crayfish is aquatic while the species is terrestrial.

Edible winged termites is used as a form of “*kola*” (cultural present for entertaining welcomed visitors) by the people of Owerri and Mbaise people of Imo State. It can also be used as a substitute for

aki (palm kernels) and groundnut in eating *garri* (a form of processed cassava) in its dry state or when sipped after being soaking in water. It is also consumed together with boiled or roasted corn and tapioca (a form of processed cassava). This agrees with findings from (4).

The species is also very popular as a sprinkle on rice and bread or other foods based on individual preference. In some communities in Anambra State such as Orumba or Aguata, it is used for preparing *igbangwu aku* (i.e maize pudding with termites). Few respondents revealed that in Mbaise area of Imo State, during the period of pronounced scarcity caused by the Nigeria civil war, the species were harvested during its season and soaked in water for about three days to make it swell and increase its size before using it as a protein supplement to prepare okra soup. Respondents claimed that okra soup prepared this way is very delicious but with a very bad smell. It is consumed raw to treat cough in Obowo community in Imo state. However, a respondent claimed that the species is consumed raw due to its efficacy in boosting sperm.

Interactions with respondents (fishermen) from Ezi-orsu community revealed that the species is used as bait in fishing when seasonally available. The species is used

specifically for harvesting some species of local fishes which are attracted by the species' smell using hook and line fishing gear. Respondents claimed that the species is used as bait in fishing in Ezi – orsu and other communities in Egbema and Oguta except Opuoma community even though Opuoma and Ezi-orsu have similar customs and ancestry. Indigenes of Opuoma that utilize the species use it only as a form of snack. The reason is because indigenes of Opuoma have not tried using the species as bait but rather adopt the traditional and indigenous method of harvesting fishes known to them. This is in agreement with findings from (14). According to respondents in Opuoma and Ezi-orsu communities, the species is also utilized as a supplement for feed in domestic animals. (13) obtained similar results.

Edible winged termites can also be used as locally sourced and readily available feed for domestic fowls, duck or dog in Opuoma and Ezi-orsu communities to supplement the dietary content of protein in feeds fed to the animals by the local populace (Figure 2).

Perception of household towards utilization of the species in the study area

Utilization of edible winged termites is linked to its perception. Respondents in the study area who utilize the species perceived it as a form of food/snack,

proteineous or because of their perception that it gives blood and strength. Few respondents in Ezi-orsu and Opuoma communities viewed its consumption as a taboo and do not utilize the species (Table 3). The species is seen as ants/insects and therefore valueless and not meant to be eaten or not regarded as food. This perception cannot be unconnected with the fact that Ezi-orsu and Opuoma as riverine communities have abundance of fish and respondents were therefore hardly in short supply of locally sourced animal protein. Consumption of edible termite by some indigenes of these two communities was brought about by either their close relationship or association with strangers or as a result of the non-indigenous wives they married.

Majority of the respondents from Choba and Rumuokwuta communities (Table 4) perceive consumers of the species from their areas as normal persons. However, few respondents who are Okrikas, Kalabaris, Emohua and Ogonis but resident in Choba and Rumuokwuta who viewed the species as taboo perceived consumers of the species from their areas as consumers of either strangers food, ant/insects, or consumers of forbidden food. This is an indication that apart from Ezi-Orsu and Opuoma that there are some other

communities which abhor consumption of the species. The fact that some respondents from Choba and Rumuokwuta communities are unaware of how consumers of the species are perceived from their areas is an indication that indigenous knowledge (of their communities) regarding the species is gradually being eroded by education and development.

Factors militating against availability, harvesting and utilization of the species in the study area

a. Factors militating against availability of the species in the study area

The major limitations to the availability of edible winged termites in the study area are seasonality and weather (Figure 3). The major factor militating against the species is season which determines its abundance. This is in agreement with (2). Edible winged termites are abundant during the rainy season unlike *Raphia palm weevil* larvae that are more abundant during the rainy season (10). This cannot be unconnected with the fact that the species swarms during this period for their “nuptial flight”.

As a result of global warming, there has been a reduction in the amount of rain fall in places that normally receives heavy rain fall.

The unpredictable change in rain fall pattern over the years due to climate change has led to deviations from the normal rainfall pattern. Consequently, there has been early, continuous, reduced or delays in rainfall at certain months of the year. The high perishability of the species is also another factor that militates against its availability. This is in agreement with (2).

b. Factors militating against harvesting of the species in the study area

The major factor limiting harvesting of the species is absence of light (Table 5). Interactions with respondents revealed that epileptic power supply or non-constant availability of light is the major factor in harvesting the species. This cannot be unconnected with the fact that the species is attracted to light. In Opuoma and Ezi-orsu communities, there is hardly power supply and majority of the rural populace cannot afford to buy generators. Even those who own generators do not keep it on till the next day or past midnight when the species normally swarms. However, when there is light and the species is seasonally available, one of the tactics for harvesting a large quantity of the species is by harvesting from different sources of light. Harvesting only from one source limits the quantity of termites that swarm from that particular

source. There is a reduction in quantity of the species harvested when native lamps are used. Apart from light, interest, determination and being conscious of the time it swarms limits harvesting. Other factors are climate change, availability, perception of individuals to the edible winged species and the presence of anthill (termitarium). Absence of termitaria in an area as is the case in Rumuokwuta community makes the species swarms through far distances and eventually gets attracted to different sources of illumination from different light sources as is common in an urban area. However, respondents perceived that the level of harvest of the species is rapidly decreasing as compared with previous years. This could be attributed to climate change.

c. Factors militating against utilization of the species in the study area

Edible winged termites are mostly collected and utilized by rural people in the study area (Table 6) but utilization of the species is determined by season, knowledge and perception towards the species. Interactions with respondents revealed that the major factor militating against utilization of the species is season. This is an indication that utilization of the species depends on the availability. In Opuoma and Ezi-orsu communities, the consumption of edible

winged termites was initially forbidden due to the abundance of fish in their area. Few respondents who are yet to utilize the species in Opuoma and Ezi-orsu communities still maintain the age-old traditional perception of the species as an ant and regarded its consumption of as a taboo and therefore forbid it. Similarly, the Okrikas and Kalabari people of Rivers State do not utilize these species due to the abundance of fish in their area. However, some of them have started utilizing the species as influenced by non-indigenes residing in their area. Interactions with respondents revealed that the species is forbidden in Emohua and Ogoni areas. This shows that the much needed animal protein could be available and affordable in times of scarcity in many areas but left unutilized due to cultural beliefs. It also reveals that cultural beliefs are gradually becoming weak in many communities, though at different pace. It also shows that though cultural beliefs are gradually becoming weakened in the face of high level of human civilization and development in many areas that some members of different communities are tenaciously holding unto them. This also reveals that a species cherished as a source of meat in an area could be forbidden in another area. This agrees with the report of (8) that consumption of both *Cricetomys*

gambianus and *Python sebae* were forbidden in Dikenafai community, as these species were regarded as messengers of the Urashi deity but many indigenes of the community later started consuming giant rat but still abhor Python due to the fact that snakes are hated by many households. Meanwhile, consumption of *Python sabae* is well cherished in Okwelle, a bordering community to Dikenafai. Consumption of *Cricetomys gambianus* and *Cercopithecus sclateri* are still forbidden among Nnewi people of Anambra State and Lagwa community of Imo state respectively (9). Few respondents do not eat edible winged termites because it is not consumed in their community.

d. Trend of consumption of the species

Interactions with respondents in Opuoma and Ezi-orsu communities revealed that the species was forbidden due to the abundance of fish in their areas but through the influence of non-indigenes from other parts of Ibo speaking areas who are married to indigenes of the community, non-indigenes living amongst them, migration and civilization, consumption of the species is rapidly increasing (Figure 4). Depletion in the abundance of fish in Opuoma and Ezi-orsu has contributed to the increase in the rate of consumption of the species. As

perceived by respondents, consumption of the species has increased to the point that indigenes of Ezi-orsu (90.0%) and Opuoma (80.4%) communities consume the species more than the non-indigenes who influenced them to be consuming it. Opuoma and Ezi-orsu are rural communities where households rely more on cheap wildlife resources for their cheap or costless supply of animal protein on daily basis. The constant increase in human population, poverty and the unaffordable high cost of meat from domestic animals continuously stimulates more households who become aware of edible winged termite to utilize it. This is different from Rumuokwuta and Choba that are urban and suburban areas respectively; where households rely more on pork, beef, chicken and fish from artificial ponds as their sources of animal protein.

Causes of species decline

Declines in quantity of the species harvested could be attributed to deforestation, climate change, civilization and development, bush-burning and chemicals/fertilizer used for agricultural practices as respondents perceived that

fertilizers and chemicals destroys termitarium (Table 7).

CONCLUSION AND RECOMMENDATION

Edible winged termite is a good source of protein and can play an important role in improving the quality of food consumed among rural and urban households when it is available. The species is under-utilized and its utilization is decreasing among the younger generations and urban dwellers. It serves as a cheap substitute for protein in the diets of Nigerians especially rural households in Southern Nigeria whose diets depend more on starch. It is good for children and women who require nutritious food and a high calorie diet. Its cheapness and high relative protein content can be harnessed to improve the nutrition of pregnant and lactating women. It can as well be used as an inexpensive and rich dietary supplement for households.

The consumption of edible winged termite should be encouraged among city dwellers. Research should also be conducted on methods to effectively preserve the species to make it available during the off-season.

REFERENCES

- [1] Adeoye, O.O, Oyelowo, O.J, Adebisi-Fagbohunge, T.A, Akinyemi, O.D (2014). Eco-diversity of Edible Insects of Nigeria and its Impact on Food Security. *Journal of Biology and Life Science* (5)2.
- [2] Ayieko, M.A. Ndong'a, F.O., Tamale, A. (2010). Climate change and the abundance of edible insects in the Lake Victoria region. *Journal of Cell and Animal Biology* 4(7)112-118.
- [3] Allotey, J. Mpuchane, S. (2003). Utilization of useful insects as food source. *African Journal of Food, Agriculture, Nutrition and Development*, 3(2): 1–6.
- [4] Bergeron, D., Rodney, J. B., Franklin, L.R, Irv, K, John, O., Alfred, A.B., (1988). The nutrient composition of an insect flour sample from Lake Victoria, Uganda. *Journal of Food Composition and Analysis* 1, 317-377.
- [5] Eggleton, P. (2000). Global patterns of termite diversity. Pages 25-51 in: T.abe, D.E. Bignell, and M. Higashi, eds. *Termites: evolution, sociality, symbioses, ecology*. Kluwer Academic Publishers, Dordrecht, The Netherlands.
- [6] Food and Agriculture Organization of the United Nations (FAO).(2013). Edible Insect-Future Prospects for Food and Feed Security. *FAO Forestry paper* 171. Rome.
- [7] Gope, B.; Prasad, B. (1983). Preliminary observation on the nutritional value of some edible insects in Manipur. *J.Adv.*2001.4:55-61. (India:Introduction)
- [8] Ijeomah, H.M., Dagba, B.I. and Aju, P.C. (2007). Local Conservation Practices and Perception of Urashi Waterfall Ecotourism Development Project, in Dikenafai Community, Imo State. *Journal of Research in Tourism(Nigeria)*,1:125-141.Nigeria
- [9] Ijeomah, H.M., Eniang, E.A. and Ikiba, B.A. (2011) .Impact of the Indigenous Conservation of Sclater's guenon (*Cercopithecus sclateri*, Pocock) in Lagwa Community, Nigeria. *Journal of Agriculture, Forestry and Social Sciences* 9 (2): 32 – 38, Nigeria
- [10] Ijeomah, H.M, and Alagoa, A. (2012). Utilization of selected non-vertebrate Wildlife species in Niger Delta, Nigeria. *Tropical Agriculture research and Extension* 15(4): 2012.
- [11] Kinyuru, J.N., Konyole,S.O. Roos, N., Onyango,C.A., Owino,V.O., Owuor,B.O., Estambale, B.B., Friis,H., Aagaard-H, J. and Kenji, G.M. (2013). Nutrient composition of

- four species of winged termites in western Kenya. *Journal of food Composition and Analysis* 30(2013)120-124.
- [12] Kent, G. (2002). Africa's Food Security under globalization. *African Journal of Food and Nutrition science* 2:22-29.
- [13] Moreki, J.C. and Tirosele, B. (2012). Termites and earthworms as Potential alternative sources of protein for Livestock. *IJAVMS* 6(5):368-376.
- [14] Paul, D. and Dey, S. (2011). Nutrient Content of Sexual and Worker forms of the Subterranean termite, *Reticulitermes* sp. *Indian journal of Traditional knowledge* 2011;10(3).505-507.
- [15] Sileshi, G.W., P.Nyeko, P.O.Y. Nkunika, B.M.Sekematte, F.K.Akinnifesi, and O.C. Ajayi (2009). Integrating ethno-botanical and Scientific knowledge of termites for sustainable termite management and human welfare in Africa. *Ecology and Society* 14(1): (online) URL:<http://www.ecologyandsociety.org/vo114/iss1art48/>.
- [16] Srivastava, S.K., Babu N., H and Pandey, H. (2009). Traditional insect bioprospecting – as human food and medicine. *Indian Journal of Traditional Knowledge* 8(4), pp.485-494.
- [17] Wikipedia, (2015a). Wikipedia the free enclopedia. Rivers State. http://en.m.wikipedia.org/wiki/Rivers_State. Accessed 9 February, 2015.
- [18] Wikipedia, (2015b). Wikipedia the free enclopedia. Termites. Wikipedia the free enclopedia. Termites. <http://en.m.wikipedia.org/wiki/Termite>. Accessed 7 April 2015.