

Edible Insect Consumption in the South Eastern Nigeria

Ebenebe , Cordelia Ifeyinwa and Okpoko Valentine Obinna

Abstract: Edible insect consumption in the south eastern Nigeria was studied to ascertain the factors that limit insect consumption, the factors that promote insect consumption, the types of insect preferred by the south eastern people of Nigeria, age bracket that consume insect the most, the policies to be adopted to increase insect consumption in the region. Three methods of data collection were used in the investigation: questionnaire structured in such a way that respondents tick yes or no in response to questions, questionnaires structured in such a way that respondent tick the column that expressed their feeling using four point Likert – type scale: Strongly agree -4 points, Agree =3 points, Disagree -2 points and Strongly disagree -1 point and oral interview. The population was drawn from the 21 Local Government Areas that make up Anambra State, a state that have full representation of people in the south east region. The result showed that level of acceptance of insect as food was least among the young people within 10-25 years of age (5.71%) and greatest among people above 25 years (50.24%). Cricket was found to be the most preferred insect but termite was the most consumed (25.95% out of 67.86% of those that eat insects as 32.14% do not eat insect at all), but termite was the most consumed (67% in the rural areas and 56% in the urban centres) because its availability as people can collect commercial quantities during their nuptial flight. Malnutrition and poverty were the factors that promote insect consumption as was seen during the civil war, such that after the war insect consumption became associated with poverty making people to loose interest in insect consumption. Of the policies that will encourage entomophagy: public awareness campaign, incorporation of insects into highly cherished foods, establishment of insect farms and processing of insects into more desirable forms: waffles, puff balls, advertisement on radio and television as well as serving in social functions by highly placed individuals scored acceptable points as policies that will promote entomophagy in this region.

Index Terms: Factors affecting entomophagy in south eastern Nigeria

1. Introduction

Consumption of edible insect (Entomophagy) is one major strategy to counter the existing problems of malnutrition in Nigeria. FAO [1] recommended consumption of 34g of animal protein per person per day for normal growth and development but in Nigeria animal protein consumption level is at 7-10g/person/day while her counterparts like Somalia and Mauritania were getting 32-34g respectively FAO 1985 cited in [2]. To bridge the gap between animal protein deficit and human population growth rate many alternative protein sources especially microlivestock has been integrated into traditional farming system in compliance with FAO [3] recommendation, yet animal protein deficit in the country is still unresolved. This is because the human population grows at the rate of 3% per annum while animal production grows at the rate of 2% per annum [4]. Farming and consumption of edible insects becomes an important tool in improving the animal protein supply in the country.

Insect consumption is indigenous to Nigeria and most other African nations, but real farming and intentional consumption to improve nutrition is limited by many composite factors. The merits of the use of insect as food have been expressed in several reports " [5], [6] [7], [8], [9] and [10]". Edible insects has been reported to be rich in protein: Winged termite (*Macrotermes bellicosus* Fig. 1) 35.88% C.P. [11], Cricket (*Gymnogrillus lucens* Fig. 2, 50.75% C.P. [12], Variegated grasshopper (*Zonocerus variegates*) 26.8% [12] and 38.72% [13], African Palm weevil (*Rhynchophorus phoenicis* Fig 3a, b and c) 28.42%

- Ebenebe, Cordelia Ifeyinwa is currently the Faculty Subdean to the School of Post Graduate Studies, Nnamdi Azikiwe, University, P.M.B. 5025, Awka, Anambra State, Nigeria. E-mail: ifynwagracey@gmail.com
- Okpoko, valentine Obinna is currently pursuing masters degree program in Biological Conservation, Department of Zoology, Nnamdi Azikiwe, University, P.M.B. 5025, Awka, Anambra State, Nigeria.

[13] and 21% [7], Rhinoceros beetle larva (*Oryctes monoceros*) 36.45% on dry weight [15]. FAO [16] showed that edible insects compare favourably with both fish and meat proteins. Ekpo and Onigbinde [6] also elucidated the high nutritional value of fatty acids found in edible insects, according to them, edible insects has fatty acids with high iodine content, an indication of the degree of unsaturation of the oil. The iodine content some insect oils like Silkworm oil 117, lepodopterous larva oil 112-119 and 108.6 -118 in phytophagous chrysolids were reported by Wigglesworth 1976 cited in [6]. Edible insects are also reported to be rich in minerals and vitamins especially iron, magnesium, zinc and thiamine, riboflavin respectively [17].

However, despite the numerous health and nutritional benefits of edible insects many people still find it absurd to eat insects i.e. to practice entomophagy, so eating of insects is relegated to the background as a practice by the poor rural communities "[18] and [19]", except for a few insects eaten by both urban and rural communities as delicacies. In recent time, when FAO and WHO are reawakening the interest of humanity towards entomophagy, it becomes imperative to assess the factors that militate against and those that promote entomophagy as basic considerations in charting the course for popularizing of entomophagy in a country like Nigeria where low intake of animal protein is responsible for many clinical and subclinical disease conditions especially among the infants.

2. Materials and Methods

The study aimed at assessing the state of edible insect consumption in the south eastern Nigeria using Anambra State as a case study. Anambra State lies between the latitudes 7°E and 7°9'1E and longitudes 6°6'N and 6°17'1N while its geographical coordinates are 6°10'0" North, 7° 4' 0" East. It is the eight most populous State in the Federal republic of Nigeria and the second most densely populated State in Nigeria after Lagos State with an estimated density of 1,500 – 2000 persons per square kilometer, covering an area of 4,419sqm with an average of 4,055,048 people in accordance with 2006 census. Thus the State is one of those grossly affected by food shortage problems in Nigeria. The State is made up of 21 local Government Areas. Thus to address the investigation intended in this study, a pretested and validated , structured questionnaire titled "State of Edible Insect Consumption in South eastern Nigeria" was used to elicit information required in this study. Four hundred and twenty respondents drawn from the 21 L.G.As in the State (20 respondents per LGA comprising people within 10-25years, 26-40 years,41-55 years, > 56years almost equal in the population) were used for the study. The questionnaires

were structured in two forms: one where the respondents will tick yes (√) and no (X) and the other where respondents were expected to tick the column which best describe their opinion, in this case the measurement scale for the instrument is a four point Likert-type scale [19] in which Strongly agree scored four points (4 points), Agree three points (3 points), Disagree two points (2 points) and Strongly Disagree one point (1 point). The instruments were administered personally to ensure 100% retrieval and also to encourage the respondents to complete the questionnaires on the basis of personal opinion rather than being influenced by other people's view. It also provided opportunity for oral interview on respondents. Besides personal administration of the instrument further eliminated delay and time loss often associated with data collection. The raw data collected were organized, tabulated and the first part was analyzed using frequencies and percentages while the second part was analyzed using additional descriptive statistics: means, standard deviation and variance, using cut off mean.

3. Results

The result on the acceptance insect within the various age bracket is presented in Table 1, and this shows that acceptance of insect was generally low among the younger generation (i.e. between 10 - 25 years old) with percentage of 5.71% while insect consumption was highest among people over 56 years old with percentage of 50.24%. Table 2 showed that 32.14% of the respondents do not favour any insect, but of the 67.86% that consume insects, cricket was the most preferred edible insect (25.92%), followed by the winged termite (20%) and the African palm weevil (15.95%). However, termite was the most consumed insects (57%) while rhinoceros beetle was the least consumed (Table 3). Of the factors militating against insect consumption in the region presented in Table 4, lifestyle was highest with percentage of 51.19%, followed by seasonality of the insects with percentage of 44.28%, while in Table 5 malnutrition (36.43%) and poverty (32.09%) got the highest percentage on factors that promote entomophagy. A similar trend was obtained for time period when entomophagy was at its peak during the war (61.90%) as the respondents believed that poverty and malnutrition was high during the war Table 6. The most outstanding reasons why a lot of people will not practice entomophagy is presented in Table 7, while Table 8 shows certain policies that will encourage entomophagy.

Table1: Acceptance level of Insect within the Various Age bracket

Age Bracket (Years)	Frequency	Percentage (%)
10 - 25	24	5.71
26 – 40	69	16.43
41 – 55	116	27.62
> 55	211	50.24

(Size 5 x 25cm)

Table 2: Most Consumed Insects in the Urban and Rural Areas

Type of Insects	Rural (%)	Urban (%)
Nil	-	38
Cricket	-	-
Termite	67	56
APW	28	6
Grasshopper	-	-
Locust	-	-
Rhinoceros beetle	5	-

APW: African Palm weevil (*Rhyncophorus phoenicis*), (Size 7.5 x 25cm)

Table 3: Preference level of Common Edible Insect

Type of Insects	Frequency	Percentage (%)
None	135	32.14
Cricket	109	25.95
Termite	84	20.00
* APW	67	15.95
Grasshopper	13	3.09
Locust	8	1.09
Rhinoceros beetle	44	0.95

- **APW** – African Palm weevil, size 8 x 25cm

Table 4: Limiting Factors to the Practice of Entomophagy

Factors	Frequency	Percentage (%)
Poverty	-	-
Customs	19	4.52
Seasonality	186	44.28
Life Style	215	51.19

Size 5 x 25cm

Table 5: Factors Promoting the Practice of Entomophagy

Factors	Frequency	Percentage (%)
Malnutrition	153	36.43
Poverty	139	33.09
Religion	10	2.38
Enlightenment	118	28.09

Size 5 x 25cm

Table 6: Time Period When Insect was at its Peak

Time	Frequency	Percentage (%)
Before the Civil War	113	26.90
During the War	260	61.90
After the Civil War	46	10.95

Size 5 x 25cm

Table 7: Reasons For Not Practising Entomophagy

Insects	Reasons
Termites	Associated with breakdown of coffin and corpse buried underground
Variegated Grasshopper	i. Obnoxious odour associated with evil spirit in some communities ii. Unpleasant spots
African Palm weevil	Appears like a bloated maggot (Housefly larvae)
Rhinoceros beetle	Some grow in goat manure and so they are unhygienic
Cricket	i. Unavailability ii. Regarded as Food for children

Table 8: Conditions that will encourage Entomophagy

S/N	Items	SA	A	D	SD	ΣX	XDecision
1.	Entomophagy can be promoted in Nigeria by Awareness Campaign	150	113	15	0	969	3.48 Accepted
2.	Incorporation of insects into other feeds will boost their consumption	78	66	47	21	625	2.95 Accepted
3.	Improving the hygiene during harvesting and sales will make more people to accept insect consumption	93	68	48	37	709	2.56 Accepted
4.	Compelling caterers and hoteliers to include insects in their menu will encourage insect eating	37	41	106	64	547	2.02 Not Accepted
5.	Increasing the cost of conventional meat sources through heavy taxation on dealers will help to promote entomophagy	43	49	118	73	677	2.39 Not Accepted
6.	Having many edible insect farms will increase Entomophagy	73	81	25	9	594	3.15 Accepted
7.	Processing of insect into more durable forms like waffle , puffed balls and chips will promote its consumption	107	111	0	3	764	3.45 Accepted

8.	Integration of insects into TV/ Radio adverts will promote entomophagy	87	123	12	1	742	3.33	Accepted
9.	Serving of insect at the social functions organized by highly placed individuals will promote entomophagy	54	58	33	23	512	3.04	Accepted

Size 20 x 25cm

Discussion

The low level of acceptance of entomophagy among young people corroborates the report of Prof Sareno Stranges, Director of Clinical Epidemiology of Warwick University and Dr. Ngianga, Principal Research Fellow in the Warwick University, who warned that the Western life style spells danger for public health in Nigeria as it has greatly influenced the dietary habit of many people in Africa leading to growing obesity epidemic in Nigeria. Nutrition transition with alarming figures on diet related diseases is already catching up in developing world. The influence of western culture on African feeding habit seems to be more pronounced in urban area than in the rural community. Sharma et al. (1996) and Mennen et al. (2000) reported that the urban lifestyle in Africa is characterized by changes in dietary habits involving an increase in consumption of refined sugars and saturated fat and a reduction in fibre intake as majority depend on imported foods. The rural community still depends on natural foods. African palm weevil is one of those natural foods largely consumed in the rural community. Of the respondents that dwell in the urban centres 38% do not eat any form of insects at all.

Although cricket (*Gymnogryllus lucens*) was the most preferred insect, the termite was the most consumed both in the rural and the urban centres, this may be attributed to the scarcity of cricket. Termites are collected by women and children during their nuptial flight usually during the rainy season and sold in both urban and rural markets. Crickets are not social insects so it is difficult to collect them in large numbers. Thus on the factors that limit insect consumption, seasonality ranks second (44.28%) behind life style (51.19%). Alamu et al. (2013) reported the influence of season in availability of common insects consumed in Nigeria. According to them, Rhinoceros beetle (*Oryctes monoceros*)

is more common is more common between June –July, Termites (*Macrotermes bellicosus*) between May to July, Cricket (*Gymnogryllus lucens*) July to September, variegated grasshopper (*Zoonocerus variegatus*) between November and April, only the APW (*Rhyncophorus phoenicis*) is available all through the year. This necessitates a study into the ecology and biology of these insects to devise means of mass producing the insects in established farms like other conventional livestock as a strategy to promote their consumption.

Result on the factors that promote entomophagy in Table 5 showed that malnutrition and poverty are the most considered factors. This corroborates the findings on Table 6 that showed that entomophagy was more common during the civil war when poverty and malnutrition was at their peak in this region, so people resorted to insect to curb the menace of malnutrition especially Kwashiokor. However, the after effect of this is that insect eating is still associated with poverty, so the rich dropped the habit for the poor, especially those in rural communities.

Of the policies that will encourage entomophagy presented in Table 8, public awareness campaign, incorporation of insects into highly cherished foods, establishing of insect farms and processing into more desirable forms: waffles, puff balls, advertisement on radio and television as well as serving in social functions by highly placed individuals scored acceptable points. Advertising can have a large impact on adoption of dietary lifestyle as it creates an association between food and good times or positive outcomes.

Conclusion

We conclude that insect flour should be incorporated into foods like noodles, waffles, biscuits and other highly cherished foods to avoid the absurdity of the feeling of eating insects while ensuring increase protein intake in the country at large. Such foods should also be served in Important functions by government and highly placed individuals as a measure to promote entomophagy in the country. Additional research should also be made on nutrient and other requirements of the insects to increase their productivity.

Acknowledgment

We acknowledge the Dean of the Faculty of Agriculture, Prof. Lucy Nwuba who created a conducive environment for research work on insect.

References

- [1]. FAO, Food and Agricultural Organization of United Nation Organization. *African Research Bulletin*. Rome, Italy.
- [2]. F. U. Okoro, "Adoption of Rabbitry Technologies Among Farmers in Okigwe Agricultural Zone of Imo State", Nigeria. *Proceedings of 25th Conference of Nigerian Society of Animal production 19th-23rd March, Michael Okpara University, Umudike, Abia State, Nigeria. pp. 414 -416, 2000.* (Conference Proceedings).
- [3]. FAO/WHO, Food and Agricultural Organization/ World Health Organization, "Energy and Protein requirement", Joint FAO/WHO Ad Hoc Expert Committee on Energy and Protein Requirement, *FAO Nutrient Report Series No.52.*

- [4]. C.A. Odukwue , "Sustainable Livestock Production for Poverty Alleviation in Nigeria", Invited Paper, Presented at the 13th Annual Conference of the National association of livestock Husbandry, Scientists and Technologists, 18th – 19th January, 2001, at Agricultural development Project, Awka, Anambra State, Nigeria.
- [5]. A.O. Onigbinde and B. Ademolekun, "The nutrient Value of *Imbraisia belina Lepidoptera: saturnidae (Madona)*", *Central Africa Journal.Med.* Vol. 44, No. 5, pp.125 -127, 1998.
- [6]. K.E. Ekpo and A.O. Onigbinde, "Pharmaceutical Potentials of *Rhyncophorus phoenicis* larval oil", *Nigerian Annals of Natural sciences.* Vol. 9, No.2. pp. 28 -32, 2004.
- [7]. C.I. Ebenebe, M.A. Anizoba, J.J. Okeke, V.O. Okpoko, B. Madu and Uzochukwu , "The Potentials of Palm Grub (*Rhyncophorus phoenicis*) and Manure grub (*Rhyncophorus ferrugineus*) as food and feed", *Journal of Advancement in Medical and Pharmaceutical Research* Vol 1 No 4 pp. 41- 45, 2007.
- [8]. W. Braide and R.N. Nwaoguikpe, "Assessment of microbiological quality and nutritional values of processed edible weevil caterpillar (*Rhyncophorus phoenicis*) in Port Harcourt, Southern, Nigeria" *International Journal of Biology And Chemical Sciences* Vol. 5, No. 2, pp. 410 – 418, 2011.
- [9]. H.M. Womeni, B. Tiencheu, M. Linder, E. M. C. Nabayo, N. Tenyang, F. T. Vielleneuve , J. Fann and M. Parmentier, "Nutritional Value and Effect of Cooking, Drying and Storage Process on Some Functional Properties of *Rhyncophorus phoenicis*", *Int. Journal of Life Sci. Pharm.Res.* Vol 2, No.3, pp.203 -209, 2012.
- [10]. O.T. Alamu, A.O. Amao, C.I. Nwokedi , O.A. Oke, and I.O. Lawal, "Diversity and Nutritional Status of Edible Insects in Nigeria": A Review. *Int. Journal of Biodiversity and Conservation.* Vol. 5, No. 4, 215- 221, 2013.
- [11]. C.E, Mba and G.O.V. Elekima, " Nutrient Composition of Some Terrestrial Insects in Ahmadu Bell University, Samaru, Zaria", Nigeria. *Science WorldJournal*Vol.2,No.2,pp.17-20,2007.
- [12]. E.A. Ekop, A.I. Udoh and D.E. Akpan, " Proximate and Anti nutritional Composition of four Edible Insects in Akwa Ibom State, Nigeria. *World Journal of Applied Science Technology* Vol. 2 No. 2 pp. 224-231, 2010.
- [13]. A.D. Banjo, O.A. Lawal and E.A. Songonuga, "The Nutritional values of fourteen species of Edible Insects in the South western Nigeria". *African Journal of Biotechnology*, Vol. 5 No. 3, pp. 208 -301, 2006.
- [14]. I. Idolo and C.H. Emeruwa, " Nutritional and anti-nutritional characteristics of the larva *Oryctes monoceros*". *Agriculture and Biology Journal of North America.* Vol 2, Issue 1, pp. 42 - 46. January, 2011, Doi:10.5251/abjna.2011.1.1.42.46.
- [15]. FAO, "The Contribution of Insects to Food Security, Livelihoods and the Environment, FAO Repository, 13266E/04.13.Available at www.fao.org/forestry/edibleinsects/en/. 2012.
- [16]. C.K. Wachukwu, C.N. Thomas, L.T. Kijig, Microorganisms Associated with Palm wine weevil Larva (*Rhyncophorus phoenicis*) *J. Dairying Food and HS* Vol. 21, pp. 44 – 47, 2012.
- [17]. S.J. Sharma, Cade and M. Jackson, "Development of Food Frequency of questionnaire in three population samples of African Origin From Cameroun, Jamaica and the Caribbean immigrants to the UK", *European Journal of Clinical Nutrition* Vol. 50, pp. 579 -586,1996.
- [18]. L.I. Mennen, J.C. Mbanuya, J. Cade., B. Barkan, S. Sharma, S. Chingong and K. Cruickshank, "The Habitual Diet in Rural and Urban Cameroun" *European Journal Clinical Nutrition.* Vol. 54, pp. 150-154, 2000.
- [19]. Egbochukwu E. O. and Ekanem I.B. (2008). Attitude of Nigerian Secondary Adolescents towards Sexual Practises: Implications for Counselling Practises. *European Journal of Scientific Research.* Vol. 22 (2): 177 – 183.



- Fig 3a.: African Palm weevil (*Rhyncophorus phoenicis*) in its Natural Habitat (Rotting Palm Trunk)



Fig 3c: Ready to eat roasted *Rhyncophorus phoenicis* larva



Fig 3b: Rhyncophorus phoenicis larva



Fig 3b: Rhyncophorus phoenicis larva



Oryctes monocerous



Macrotermes bellicosus



Rhyncophorus phoenicis



Fig 2 : Cricket (*Gymnogryllus lucens*)