E3 Journal of Environmental Research and Management Vol. 3(7). pp. 124-128, August, 2012
Available online http://www.e3journals.org/EJERM
ISSN 2141-7466 © E3 Journals 2012

Full Length Research Paper

Comparison of edible frog (*Rana esculenta*) and other bush meat types: Proximate composition, social status and acceptability

O.O. Oduntan[1], J.A. Soaga[1] and A. Jenyo-Oni[2]

[1]Department of Forestry and Wildlife Mgt, Federal University of Agriculture, Abeokuta Ogun State, Nigeria.
[2]Dept of Fisheries and Aquaculture University of Ibadan, Nigeria

Accepted 3 August, 2012

This paper investigated and compared nutrients in Edible Frog (R.esculenta) with other Bushmeat types as well as showcases the willingness of the human populace to accept Edible Frog for consumption based on its social status at Odeda Local Government Area of Ogun State, Nigeria. Both primary and secondary data were used for the study. Proximate composition and social evaluations were analysed using standard methods. Data reveals significant difference (P<0.05) in all classes of nutrient among the meat types, except Fat content. R.esculenta has the highest values (mg 100g-1DM) of Calcium (2337l), Magnesium (1701), Pottasium (982), and Iron (390), compared with other bushmeat types. Edible frog provides more than four times of Calcium available in other bushmeat samples. Chi-Square analysis shows a significant difference (p<0.05, X2=21.841) in willingness of respondents to accept Edible Frog (R.esculenta) among various family sizes, (if it is more nutritious than other bushmeat types).

KEYWORDS: Wildlife Conservation, Food Security, Animal Protein, Wildlife Utilization

INTRODUCTION

Bush meats are meat of any wild animals hunted for food and it is not necessarily from an endangered species. Bush meat constitute of vast array of species ranging from grass cutter, snakes, duikers, bush pig, snail, guinea fowl , hare, brush tailed porcupine, giant rat, edible frogs etc (Abulude 2004).

The magnitude of exploitation and consumption of bush meat however varies from country to country and is determined primarily by its availability but is also influenced by governmental controls on hunting, socio-economic status and cultural prohibitions. People collect, hunt or purchase and eat bush meat for their animal protein supply either because they have no other source or cannot afford alternative sources (Akinyemi and duntan, 2004). Others eat bush meat as a matter of preference or as a delicacy to be eaten on special occasions. The reality in Africa is that for the greater Majority of rural people, bush meat represents a vital dietary item for a complex combination of reasons dictated by lack of alternative sources, financial limitations, preference and cultural values. For such people wildlife animals constitute a valuable food resource which cannot be easily withdrawn or replaced without causing wide-ranging socio-economic imbalance (Bowen Jones et al, 2003).

Bush meat: An alternative source of animal protein

Bush meat is an important source of animal protein in

*Corresponding author email:oladapo.oduntan@yahoo.com

both rural and urban households throughout Africa. In southern Africa, an average bushman do not keep any domestic stocks and rely heavily on wild animals for their protein (Maliehe, 1993). In Tanzania, people living around forests and grasslands are provided with food security in the form of cheap bush meat (Chihongo 1992). A considerable amount of work was done in the '70s and early '80s to document bush meat consumption particularly in West Africa.

The data on consumption however, were mostly based on estimates of the number of people who eat bush meat or on estimates of bush meat contribution to national protein supply. Some of the earlier studies in the region gave annual wild animal consumption figures ranging from 20% of the animal protein among rural people living in Nigerians rain forest area, as compared with 13% in the whole country (Ajayi, 1979). Willkie et al. (1999) found that majority of people's diets in Congo Basin consisted of carbohydrate for example from cassava. Due to the above reason local indigenous people hunt for bush meat to either supplement their intake of protein or to fill it completely (Wilkie et al 1999, Carport et al 2001, Newing et al, 2001 and De Merode et al 2004).

Ecological Implication Of Bushmeat Harvesting And Edible Frogs Comparative Advantage

However, rapid human population growth and socio–economic change has transformed bush meat into a commodity traded on a vast scale throughout western and central Africa (Apantaku et al, 1998). Academic attention over the last decade has primarily focused on ascertaining the extent of this trade and the sustainability of wildlife harvest. The impact of harvesting on terrestrial vertebrates has caused international concern but marginalizing those that rely on this resource is not on effective solution. Bush meat utilization is of nutritional and economic importance to rural communities. The economic importance of bush meat harvesting as a flexible income generating activity has surpassed nutritional benefits. Apantaku et al (1998). Bowen Jones et al (2003) also argued that bush meats have high nutritional and economical importance but it is an ecologically unsound source of protein.

This is as a result of the massive impact that uncontrolled harvesting of wildlife resource has on its abundance and distribution. The population of many wild animal species in Africa is on the decrease while it is very difficult to come across many in the wild not to talk of harvesting. Edible Frog (Rana esculenta) however, has a comparative advantage in this light; as it is in great abundance and widely distributed in most West African countries especially in the swampy, rainforest, and savannah eco-zones. Its abundance could be traced to the number of eggs it lays and hatched at once, inability of some people in distinguishing between edible frog and the other poisonous and irritating toad as well as probable negligence of some to the consumption of edible frog. Many researchers have (Abdullahi, 2000; Adeyeye, 2002; Oke et al, 2004; Omojola et al, 2004; Abulude, 2004 and 2007) reported on meat of differen species of edible farm animals, especially in Nigeria, but none has worked on Edible Frog reported on in this paper. The aim of this paper is to compare the nutrients and minerals in Edible Frog with other Bush meat types as well as showcase the willingness of the human populace to consume Edible Frog based on its social status in the study area.

MATERIAL AND METHODS

Study Area

Odeda Local Government is one of the twenty local governments in Ogun state of Nigeria. Its share boundaries with Oyo State and Ewekoro, Obafemi – Owode Local Government to the South, Yewa North, Odeda Imeko Afon Local Government areas to the West East and North respectively. Though predominantly occupied by Yoruba ethnic group, Odeda Local Government is generally inhabited by people from all sub – ethnic group in Nigeria and neighboring West African States and endowed with physical and human resources.

Two important rivers in the study area are the Ogun and Oyan rivers, both flowing from Oyo North around Igbeti and Saki respectively in Oyo State forming a confluence at Abeokuta North Government (Popoola, 1990). The annual rainfall, which normally spreads over 8 months between April and November, ranges between 100mm to 200mm, having bi–modal pattern with the peaks at May /June and September / October, (Oluwalana 1997). The relative humidity is high all the year and generally above 80% during the wet season and ranges between 60% and 80% during the dry season. The average maximum daily temperature varies from 280C in the rainy season to 320C in the dry season (Onakomaiye et al, 1992).The study area is inhabited with people of diverse occupations such as agriculture, Trading, Dyeing, Pottery, Fashion designing, Hunting, Fishing, Driving, Teaching and Civil Services.

Sampling Handling And Preparation

Analysis:

This paper used Odeda Local Government area as case study for studying acceptability of Edible Frog (R.esculenta) and other social related issues. Hence, Edible Frog samples were purchased from Alogi market

Table 1: Proximate Composition of Sample Analyzed

Parameters (%)	1st Sample	2nd Sample	3rd Sample	Mean Value
Fat Extraction	1.999	2.137	2.132	2.089
Ash Content	42.257	44.965	42.479	43.234
Crude Protein	6.738	7.348	6.758	6.948
Moisture	8.89	8.84	9.28	9.00

In addition, the mean elemental analysis reveals that Edible Frog (*R.esculenta*) contains 98.24mg/l of Potassium, 17.07mg/l of Magnesium, 3908.1mg/l of Iron and 2337.0mg/l of Calcium, as shown in Figure 1.

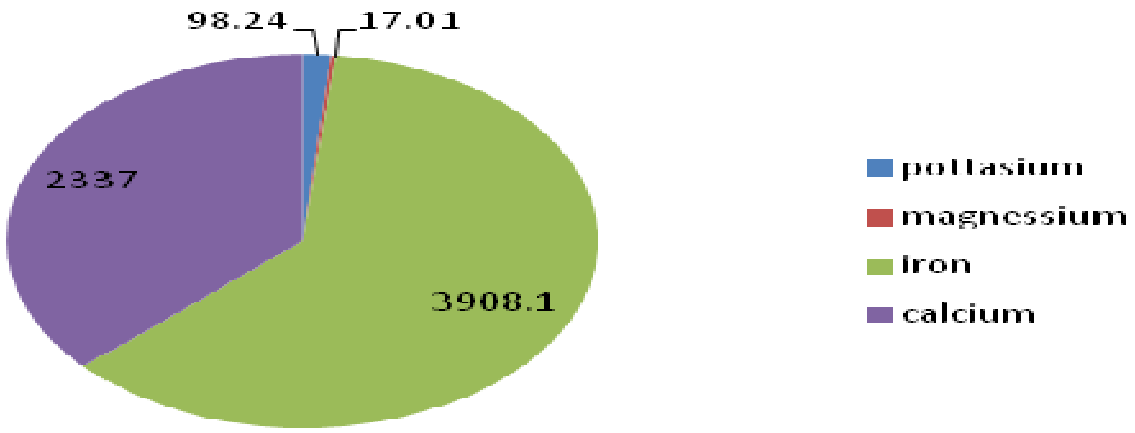

Figure 1: Mineral Composition of Sampled Analysed (mg/l)

of Odeda Local Government Area. Other materials used include mortal and pestle, hand girder, transparent nylon bags

Proximate Composition

Proximate composition of samples was determined using AOAC methods (1990). Moisture content was measured by weighing differences before and after oven-drying at 1000C-1050C for 16 hours. Protein content (%N X 65) was determined by the Kjeldahl Methods. Ash content was determined using dry ash procedures. Fat content was measured by drying the samples in 1000C oven and then extracting the crude fat with petroleum ether in a Soxhlet extractor for 4hours. All samples were done in triplicate.

Secondary data on proximate composition of three (3) most commonly traded bush meat types were obtained from published articles and used for comparison in this study. The three bush meat types are Giant Rat (Cricetomys gambianus),Grasscutter (Thryonomys swinderianus) and Giant Tree Squirrel (Protoxerus stangeri). Referenced articles include Malaise and Parent (1981) and Abulude (2007).

Sampling Procedure (Social Data)

Primary data were collected by administering a total of 210 questionnaires in the study area. Half (105) of the total number of questionnaires were randomly in rural areas of the Local Government Areas, for fare representation of respondents. Information acquired via the questionnaires include, the socio-economic status of respondents, which include: age, gender, family size, educational background, tribe, religion and financial status. Data was also collected on willingness to accept Edible Frog (Rana esculenta).

Data were analyse using descriptive statistics, while evaluation were made using SPSS for windows. The study analysed the socio-economic status of the human population and determines their willingness to accept edible Frog, using Pearson Chi Square test.

RESULTS AND DISCUSSION

Proximate composition analysis (Table 1) shows 2.09% Fat content, 43.234% Ash content, 6.948% Crude Protein and 9.00% Moisture Content as mean value of triplicate samples of Edible Frog (Rana esculenta). Comparison of

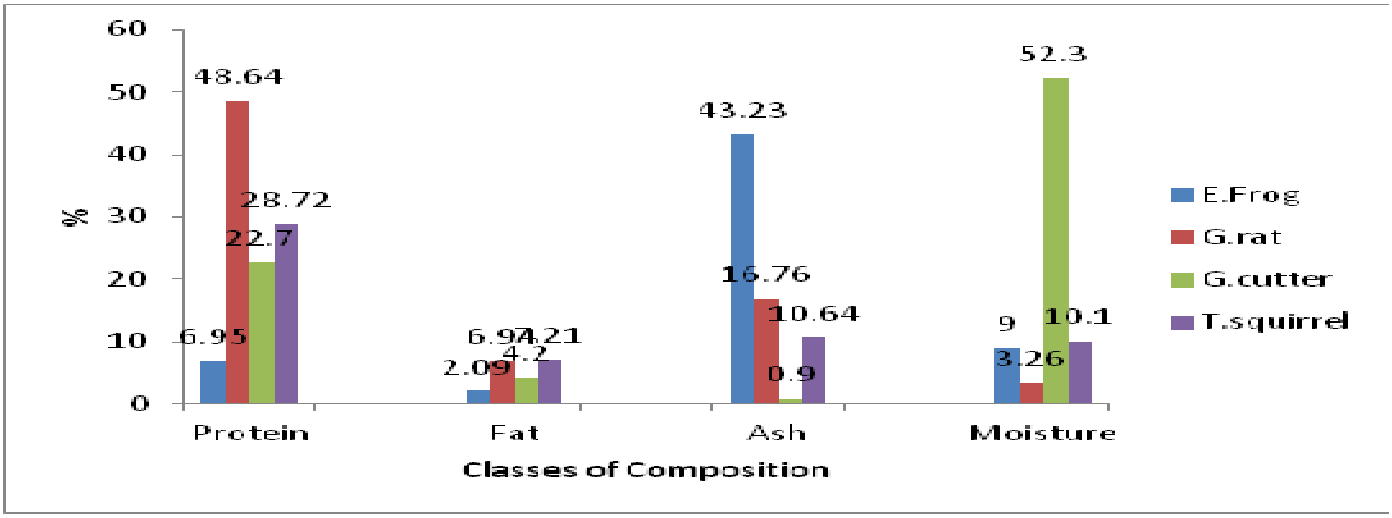

Figure 2: Comparison of Proximate Composition of Edible Frog & Other Bush meat Types

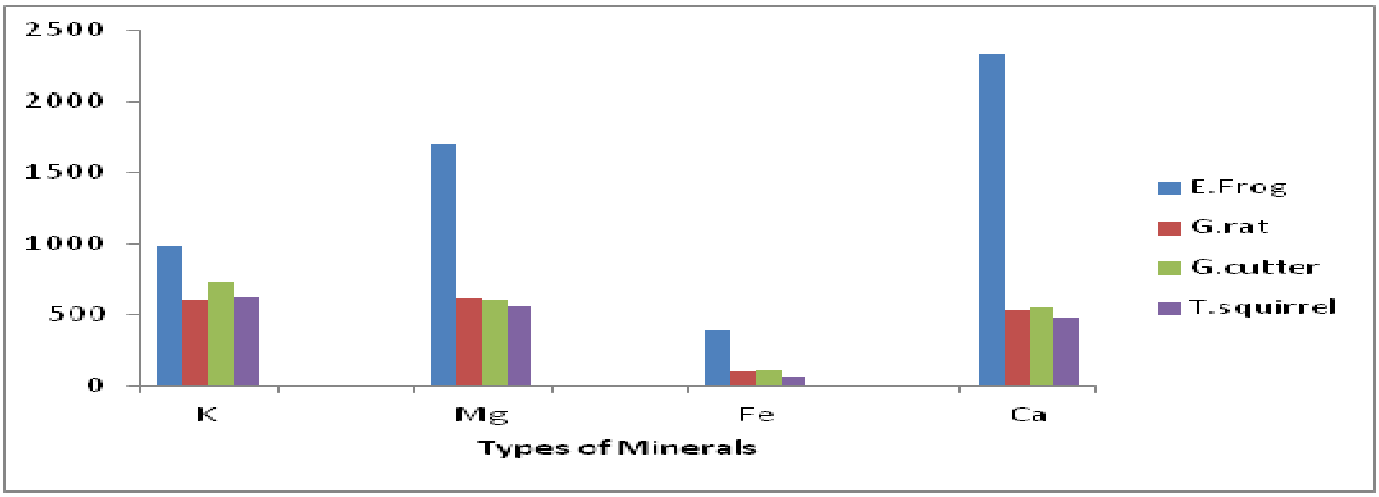

Figure 3: Comparison of Mineral Composition of Edible Frog & Other Bush meat Types

mean proximate composition of Edible Frog with other three bush meat types (Figure 2) reveals the lowest value of 6.95% and 2.09% for protein and Fat content respectively. Ash content of Edible Frog (43.23%) however far outweigh Giant rat (16.76%), Grass cutter (0.9%) and Giant Tree Squirrel (10.64%). The data however reveals that there is significant difference ($P<0.05$) in all classes of nutrient among the meat types, except Fat content. This is in line with the findings of Davies (2002), which states that many wild animal species are characterized with low fat content.

Mean value of each mineral that was measured revealed that Edible Frog (R.esculenta) has the highest values (mg 100g-1DM) of 2337l Ca (compared with 532, 549 and 475 for Giant rat, Grasscutter and Giant Tree Squirrel respectively), 1701Mg (compared with 620, 607 and 560 for Giant rat, Grasscutter and Giant Tree Squirrel respectively), 982K (compared with 610, 730 and 625 for Giant rat, Grasscutter and Giant Tree Squirrel respectively) and 390 Fe (compared with 98, 110 and 68 for Giant rat, Grasscutter and Giant Tree Squirrel respectively), as shown in Figure 3.

Considering the proximate composition of Edible Frog (as revealed from the result) and the report of Food and Agricultural Organisation (1995), which states that the situation of malnutrition in Africa is becoming increasingly critical; Edible Frog (R. Esculenta) can serve as competent gap filler in countries where it is in abundance

Table 2: Willingness to Accept Edible Frog (if more Nutritious) among Various Family Sizes

Family size	If, More Nutritious neutral	Never	not very willing	not willing	very willing	Willing	Total
1-3	13	12	1	21	48	68	163
	8.0%	7.4%	.6%	12.9%	29.4%	41.7%	100.0%
4-6	4	0	1	0	7	18	30
	13.3%	.0%	3.3%	.0%	23.3%	60.0%	100.0%
≥7	0	0	0	0	6	1	7
	.0%	.0%	.0%	.0%	85.7%	14.3%	100.0%
	17	12	2	21	61	87	200
Total	8.5%	6.0%	1.0%	10.5%	30.5%	43.5%	100.0%

like Nigeria.

Social Status And Acceptability Of Edible Frog

Social acceptability test of Edible Frog (R.esculenta) show that 85.7% of respondents with family size of seven and above were very willing to accept Edible Frog for regular consumption, if it is proved comparatively more nutritious than other sources of animal protein (Table 2). Chi-Square analysis shows a significant difference ($p<0.05$, $X2=21.841$) among various family sizes in willingness to accept Edible Frog (R.esculenta), if it is more nutritious than other bushmeat types.

Since the more number of people in a family, the more likely the challenge and pressure to meet up with nutritional demands; thus largest family sizes of seven and above (≥7) are willing to accept and possibly adopt Edible Frog (R.esculenta) in their meal as alternative source of animal protein, if it is more nutritious and since it is comparatively cheaper. This is in line with the findings of Akinyemi and Oduntan (2004) that wildlife exploitation in Nigeria are not activities in which people engage in for the purpose of deriving leisure, rather it is an activity associated with the upliftment of living standard of people.

CONCLUSSION AND RECOMENDATION

The need for cheap, affordable, readily available and qualitative animal protein in human diet cannot be over emphasized; hence, this study reveals that Edible frog (Rana esculenta) which man has not substantially exploited for food in this part of the world can serve as an important source of animal protein and other vital nutrients in human diets. Although the protein content per gram of Edible Frog is comparatively smallest, the price of one gram of sample however will give the opportunity to eat as many as to negate this effect. Further studies will seek to compare the economic feasibility of Edible Frogs (R.esculenta) with other bush meat types. Since the Fat content in Edible frog (R.esculenta) in comparison with others is smallest, it can then serve has a good substitute of animal protein source with fat content for those who are mindful of that. Edible frog provides more than four times of Calcium available in other bushmeat samples. This makes it more nutritious in terms of strong bone and teeth development, most especially in young children, old men and women.

There should be public awareness through magazines, journals, articles and broadcasting stations to enlighten the populace at large about the importance and the nutritive value of Edible frog in solving the protein deficiency problem in Sub-Sahara Africa and other developing countries that are yet to exploit this opportunity.

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