



ASSESSMENT OF FROG MEAT UTILISATION IN IBADAN, OYO STATE, NIGERIA

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ABSTRACT

*Frogs are among the most threatened species of wildlife in IUCN red list. Its utilisation in Ibadan, a major depot in western Nigeria was therefore conducted with the aim of assessing the forms and trend of use; and amongst others, reasons for frog meat consumption. Data for the study were collected through questionnaire, in-depth interviews and field observations. The questionnaire was administered randomly to 50 frog consumers from each of the two selected local government areas, while all traders (27) who sell frogs for medicinal purposes were also interviewed. Data collected were summarised using descriptive statistics. Results showed that only 35.0% of the respondents utilize frog for other purpose apart from consumption. Among these few respondents, 94.3% use it for medicinal purposes. Frog species used for medicinal purpose includes *Amietophrynus regularis*; *Tomopterna cryptotis*; and *Ptychadena mascareniensis*. All the respondents (100%) buy the frogs utilised, have knowledge of the sellers and were unaware of frog farms in Nigeria. All the respondents (100%) considered frog meat desirable and preferred it when dried. Almost all the respondents (98.0%) have consumed frog meat more than 10 times. Majority of the respondents (65.0%) consume frogs because of its nutritional value while few (35.0%) eat it due to economic reasons. Most respondents (77.0%) prefer the meat for its flavour, and consumed it whole (78.0%). Frog meat sold for ₦100 is most preferred by respondents (44.0%). Majority of the respondents (65.0%) buy frog meat once a week but utilize it twice a week (39.0%) or once a week (38.0%). However, 70.0% of the respondents would buy more frogs if they had more money. Majority of these respondents (84.0%) are unwilling to engage in frog farming.*

Keywords: Frogs, Utilization, Wildlife, Biodiversity Conservation

INTRODUCTION

The progressively rising cost and inadequate supply of animal protein to feed the ever increasing human population have made the conventional animal protein such as beef and poultry meat an unaffordable luxury. This has necessitated the search for alternative, cheap, and readily available animal protein source such as frog meat. Frog meat has been utilized for various purposes in Nigeria and other parts of the world. Frogs belong to a class of vertebrate known as amphibians; the most threatened taxa of wildlife with the 2008 IUCN Red List classifying one-third of the 6,000 described amphibian species as

threatened. However, the declining rate of frogs among other amphibians has not deterred their exploitation and utilization for various purposes (Altherr *et al.*, 2011).

An increase in the size of human population also tends to increase the existing pressure on wildlife resources population (Akinyemi and Efenakpo, 2015). Frogs are valued as food, pet, ethno medicine, research and educational specimen by humans and they also play cultural roles in literature, symbolism and religion. Frog legs are eaten by humans in many parts of the world due to their palatability (in China and other Asian countries) and availability among other reasons. In

addition, their ethno-medicinal potentials have also been exploited for medicinal purposes. Farming of the utilized species of frogs in Africa and the world as a whole has been generally neglected whereas the rate of utilization is continuously increasing. According to Mohnke (2011) frog species mainly used for food, medicinal purposes and pet trade in different parts of the world are normally sourced from the wild.

Frogs have also served as experimental animals throughout the history of science and till date they are still being used for dissections in laboratories. An Italian physiologist, Luigi Galvani discovered a link between electricity and the nervous system by studying frogs in the eighteenth century (Wells, 1859). In the establishment of the Stannius Ligature procedure H. F. Stannius used a frog's heart to show that the ventricle and atria parts of the heart beats independently of each other at different rates (Stannius, 1852). An English zoologist Lancelot Hogben in an experiment injected a sample of urine from a pregnant woman into a female frog which induces it to lay eggs; this was as a result of the presence of large quantities of human chorionic gonadotropin hormone found in the urine of pregnant women (Sarkar, 1996). Frogs and toads among other amphibians have also been used in cloning research and other branches of embryology. Brownlee (2012) reported that in 1952, Robert Briggs and Thomas King cloned a frog by somatic cell nuclear transfer. In addition, Frog toxins have also been widely used by biochemists and other researchers. According to Phillippe (2005) dart poisons are under active investigation and research showing the poison has potential for use in manufacturing therapeutic drugs. An alkaloid epibatidine (painkiller) which is 200 times more potent than morphine have also been found to be present in some species of poison dart frogs (VanCompernelle *et al.*, 2005). Also, exudates from the golden poison frog (*Phyllobates terribilis*) skin are traditionally used by native Colombians to poison their darts for hunting wild animals (Myers *et al.*, 1978). Frogs have also

featured prominently in folklore, fairy tales, and popular culture. Berrin and Larco (1997) identified that the Moche people of ancient Peru worshipped animals such as frogs and often portrayed frogs in their art. The wide utilization of frogs within and outside Nigeria has prompted this research aimed at assessing the different forms of frogs' utilization and the sources of consumed frogs in the study area, respondents' knowledge and awareness about frog farming, perceived frog populations, and Consumer's desirability of frog meat in the study area.

METHODOLOGY

Study Area

The study area, Ibadan city is geographically located on latitude 7°23' 47" N and longitude 3°55' 0" E. Two local government areas; Akinyele (Figure 1) and Ibadan North (Figure 2) were randomly selected from the five local government areas in Ibadan city in line with Akinyemi and Efenakpo (2015).

Data Collection and Analysis

Data for the study were obtained through pre-tested semi-structured questionnaires, in-depth interviews and field observations. For the sake of this research frogs were classified into various categories of sizes as packaged for different prices by sellers in the market. The various categories are: Big size (300.0g and above); Medium size¹ (200.0g – 299.9g); Medium size² (136.3g – 199.9g) and small size (136.2g and below). The set of pre-tested semi structured questionnaire was administered randomly to 50 frog consumers each from the two Local Government Areas. In all 100 frog consumers were interviewed while traders involved in sales of frogs for medicinal purposes were also interviewed. The questionnaires were written in English but administered with the aid of field assistants who speak and understand both Yoruba and Hausa languages.

Data collected through questionnaire were analysed using descriptive statistics.

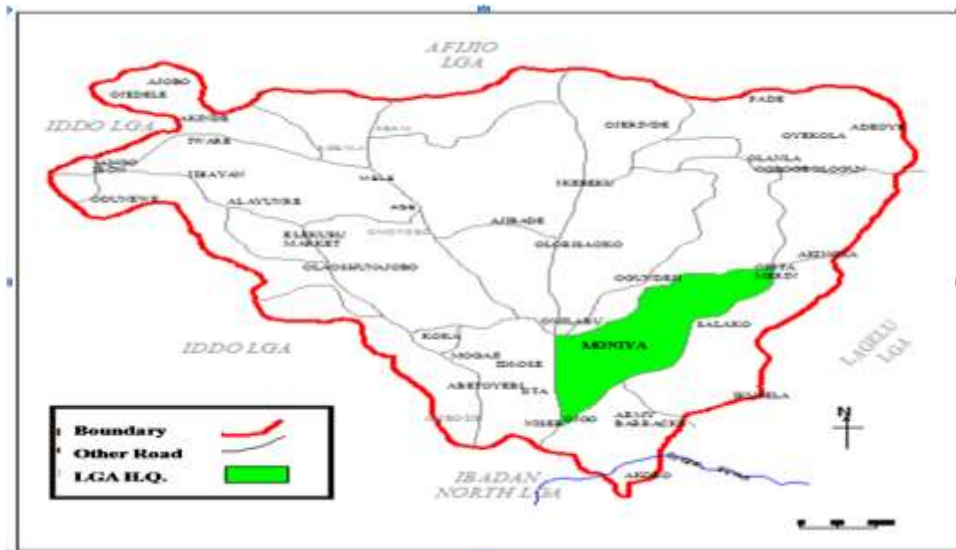


Figure 1: Map of Akinyele Local Government Area showing the different towns and wards
Source: Owoeye (2013)

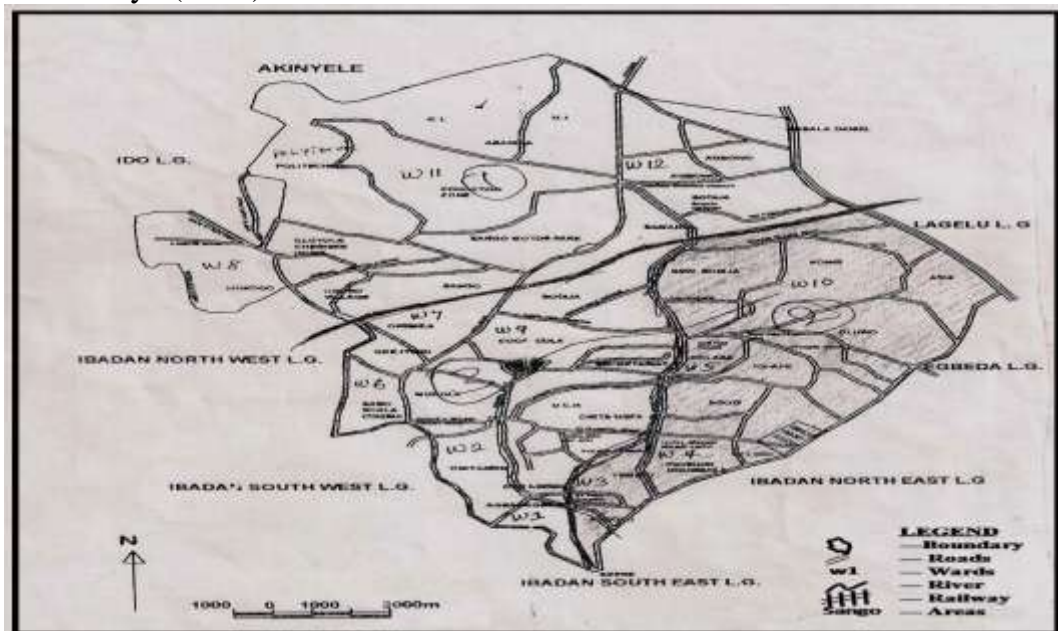


Figure 2: Map of Ibadan North Local Government Area showing different towns and wards.
Source: Department of Town Planning, Ibadan North LGA, Oyo state, Nigeria (2015).

RESULTS

Consumer's utilization of frog meat in the study area

Results on consumer's utilization of frog meat in the study area are presented in Tables 1 and 2. Table 1 shows that only 35.0% of the consumers admitted using frog for other purpose apart from eating. Among the few respondents who use frogs for other purposes apart from food, 94.3% claimed using it for medicinal purposes while only 5.7% use it for research and educational purposes. None of the respondents admitted using frogs as pet. The

respondents who admitted using frogs for other purposes are from Ijaiye, Moniya, Ojoo, Arisekola and Bodija with values of 28.6%, 22.8%, 20.0%, 17.1% and 11.4% respectively. Out of the eight species of frogs identified in the study area, four are used for food while the remaining four are used for medicinal purposes by respondents (Table 2). Among those used for medicinal purposes are *Amietophrynus regularis* (Plate 1), *Tomopterna cryptotis* (Plate 2) and *Ptychadena mascareniensis* (Plate 3) while African bull frog (*Pyxicephalus edulis*) (Plate 4) is mostly used for consumption

Table 1: Consumer's utilization of frog meat in the study area

Note: freq= frequency, %= Percentage, CF= Cumulative frequency, % CF = Percentage of cumulative frequency

Source: Field survey 2014

Parameters /Variables	Arisekola		Bodija		Ijaiye		Moniya		Ojoo		Total	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	CF	%CF
If respondents make other uses of frog apart from eating												
Yes	6	30.0	4	20.0	10	50.0	8	40.0	7	35.0	35	35.0
No	14	70.0	16	80.0	10	50.0	12	60.0	13	65.0	65	65.0
Other uses												
Medicine	6	100	4	100	10	100	7	87.5	6	85.7	33	94.3
Pet	0	0	0	0	0	0	0	0	0	0	0	0
Research/Education	0	0	0	0	0	0	1	12.5	1	14.3	2	5.7

Table 2: Consumer's utilization of frog meat in the study area

S/No	Frog species	Uses	Diseases/ illness treated
1	<i>Hildebrandtia ornate</i>	Food	Nil
2	<i>Hoplobatrachus occipitalis</i>	Food	Nil
3	<i>Ptychadena pumilio</i>	Food	Nil
4	<i>Pyxicephalus edulis</i>	Food	Nil
5	<i>Bufo pentoni</i>	Medicine, Mythic	bed-wetting, cough and rain maker
6	<i>Ptychadena mascareniensis</i>	Medicine	Scorpions' sting, umbilical hernia,
7	<i>Tomopterna cryptotis</i>	Medicine	Constipation, measles, umbilical hernia, wounds
8	<i>Amietophrynus regularis</i>	Medicine, Mythic	Appendicitis, cough, measles, market fortune



Plate 1: *Amietophrynus regularis* used for medicinal purpose in Ibadan



Plate 2: *Tomopterna cryptotis* used for medicinal purpose in Ibadan



Plate 3: *Ptychadena mascareniensis* used for medicinal purpose in Ibadan



Plate 4: African bull frog (*Pyxicephalus edulis*) from Moniya market Ibadan mostly used for consumption

Awareness of markets to buy frog meats in the study area

Results of consumer's awareness of markets to buy frog meat in the study area are presented in table 3. The Table shows that all the respondents (100%) buy the frogs utilised, had knowledge of the sellers and were unaware of frog farms in Nigeria. Majority (90.0%) of the respondents perceived that the price of frog meat had always remained stable. Only 22.0% of the respondents

knew people who had ever hunted frogs while majority (78.0%) did not. Only 2.0% of the respondents (all from Arisekola) had knowledge of researches relating to frog consumption that were conducted in the study area. More than half of the respondents (55.0%) opined that the frog meat market is stable in relation to the numbers of sellers unlike the 45.0% who perceive that the number of traders was increasing.

Table 3: Consumers' Awareness of where and how to access frogs in the study area

Parameters/ Variables	Frequency						Percentage (%)					
	ARI	BOD	IJAI	MON	OJO	CF	ARI	BOD	IJAI	MON	OJO	%CF
Source of frog												
Bought	20	20	20	20	20	100	100	100	100	100	100	100
Caught	0	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0	0	0
Has the price always been like that												
Yes	17	18	19	18	18	90	85.0	90.0	95.0	90.0	90.0	90.0
No	3	2	1	2	2	10	15.0	10.0	5.0	10.0	10.0	10.0
If [NO], how did it change												
Increased	0	0	0	0	1	1	0	0	0	0	50.0	10.0
Decreased	0	0	0	0	0	0	0	0	0	0	0	0
Varies	3	2	1	2	1	9	100	100	100	100	50.0	90.0
Awareness of frog sellers												
Aware	20	20	20	20	20	100	100	100	100	100	100	100
Not aware	0	0	0	0	0	0	0	0	0	0	0	0
If consumers know others who hunt frogs												
Yes	4	2	4	6	6	22	20.0	10.0	20.0	30.0	30.0	22.0
No	16	18	16	14	14	78	80.0	90.0	80.0	70.0	70.0	78.0
Consumers knowledge of frog farms in Nigeria												
Yes	0	0	0	0	0	0	0	0	0	0	0	0
No	20	20	20	20	20	100	100	100	100	100	100	100
Have any study been carried out in this area on frog consumption												
Yes	2	0	0	0	0	2	10.0	0	0	0	0	2.0
No	18	20	20	20	20	98	90.0	100	100	100	100	98.0
What is the frog market like in relation to traders												
Stable	17	6	12	13	7	55	85.0	30.0	60.0	65.0	35.0	55.0
Increasing	3	14	8	7	13	45	15.0	70.0	40.0	35.0	65.0	45.0
Decreasing	0	0	0	0	0	0	0	0	0	0	0	0

Note: ARI= Arisekola, BOD=Bodija, IJAI= Ijaiye, MON = Moniya, OJO = Ojoo, CF= Cumulative frequency, %CF= Percentage of cumulative frequency

Source: Field survey 2014

Consumer's desirability of frog meat in the study area

Results on desirability of frog meat by respondents are presented in Table 4. The results show that all the respondents (100%) considered frog meat desirable and preferred it when dried. Majority of the respondents (98.0%) have consumed frog meat more than 10 times, despite the fact that only 9.0% of the consumers have hunted it in the past. Majority of the respondents (65.0%) consume frogs because of their nutritional value while few (35.0%) eat frogs due to economic reasons. Most respondents (77.0%) prefer the meat for its flavour, and consumed it whole (78.0%) instead of disposing certain edible parts. Table 4 also shows that 83.0% of the respondents had preference for different species of frogs.

Most respondents (94.0%) purchase frog meat for consumption purpose alone, while 6.0% purchased it for both sales and consumption purpose. The medium size² (136.3 – 199.9g) sold for ₦100 is most preferred by respondents (44.0%). Majority (65.0%) acquired frog meat once a week but utilize it twice a week (39.0%) or once a week (38.0%). However 70.0% of the respondents would buy more frogs if they had more money. It was unfortunate that vast majority of these respondents (84.0%) are unwilling to engage in frog farming. About 81% of the few (16 respondents) who want to practice frog farming accepted to do so because of perceived high profit level of the business.

Perceived population of frogs by respondents in the study area

Results on respondents' perception of frog species' population are presented in Table 5. Majority of both the trader and consumer respondents (83.5%) perceived that the population of frogs is increasing as there are a lot of eggs and tadpoles in streams and riverbanks.

DISCUSSION

Utilization of frog meat in the study area

Frogs were mostly used for food in the study area. Apart from food, frog species were also used for medicine and partly research and

education. It was not used as pet in the study area. These findings agree with the studies of Mohnke (2011) and Onadeko *et al* (2011). Personal interaction with consumers and traders of medicinal frog species revealed that frog species are used for the treatment of various diseases which includes; appendicitis, bed-wetting cough, constipation, measles, scorpions' sting, umbilical hernia, and wounds (Table 2). The use of frog species for treatment of these diseases can be attributed to high level of awareness about the value of existing forest and wildlife resources in the environment by respondents. This also shows that the utilization of the species started with the ancient inhabitants of the study area as awareness of these uses by respondents was through indigenous knowledge. Frog species can also be used for preparation of concoctions for good market and rainfall. Ijeomah and Ugwu (2016) gave a similar report that tortoise is used to prepare concoction for good fortune in Nsukka Area of Enugu State.

Awareness of Frog markets in the study area

The consumers are aware of frog meat sellers, the location of sales, the price of sales and the regularities of sales (Table 3). This can be attributed to the facts that most of the respondents have lived in the community for over 10 years and have utilized frog species within the period. Few respondents (22.0%) who claimed knowledge of people who hunted frog species were mostly from Arisekola and Ijaiye. Ijaiye is a rural area and residents therein could have observed rural natives hunting frogs in the locality, while consumers at Arisekola are more in contact with the main dealers of frog meat and possibly because of their nativity. According to the results in Table 3, only consumers from Arisekola had knowledge of research relating to frog meat consumption in the study area because it is the major depot of frog meat in the study area and must have drawn the interest of researchers and observers. During the course of the research respondents confirmed that a television station had interviewed traders and consumers on frog meat consumption in Arisekola.

Table 4: Consumer's desirability of frog meat in the study area

Parameters/ Variables	Frequency						Percentage (%)					
	ARI	BOD	IJAI	MON	OJO	CF	ARI	BOD	IJAI	MON	OJO	%CF
If consumers like frog meat												
Yes	20	20	20	20	20	100	100	100	100	100	100	100
No	0	0	0	0	0	0	0	0	0	0	0	0
Number of times consumers have consumed it												
<5	0	0	0	0	0	0	0	0	0	0	0	0
5 - 9	0	2	0	0	0	2	0	10.0	0	0	0	2.0
≥10	20	18	20	20	20	98	100	90.0	100	100	100	98.0
If consumers hunt												
Yes	3	0	0	5	1	9	15.0	0	0	25.0	5.0	9.0
No	17	20	20	15	19	91	85.0	100	100	75.0	95.0	91.0
Why do you eat it												
Nutritional	12	13	12	12	16	65	60.0	65.0	60.0	60.0	80.0	65.0
Economical	8	7	8	8	4	35	40.0	35.0	40.0	40.0	20.0	35.0
Availability	0	0	0	0	0	0	0	0	0	0	0	0
Why do you prefer it												
Flavour	17	18	14	12	16	77	85.0	90.0	70.0	60.0	80.0	77.0
Tenderness	2	2	5	6	2	17	10.0	10.0	25.0	30.0	10.0	17.0
Medicinal	1	0	1	2	2	6	5.0	0	5.0	10.0	10.0	6.0
Frog parts consumers consume												
Legs	0	0	0	0	0	0	0	0	0	0	0	0
Trunk-Head	2	4	1	5	10	22	10.0	20.0	5.0	25.0	50.0	22.0
Whole Frog	18	16	19	15	10	78	90.0	80.0	95.0	75.0	50.0	78.0
If consumers have preference for species												
Yes	16	16	14	18	19	83	80.0	80.0	70.0	90.0	95.0	83.0
No	4	4	6	2	1	17	20.0	20.0	30.0	10.0	5.0	17.0
Form preferred												
Dried	20	20	20	20	20	100	100	100	100	100	100	100
Fresh	0	0	0	0	0	0	0	0	0	0	0	0
Roasted	0	0	0	0	0	0	0	0	0	0	0	0
Willingness to buy frog meat for consumption												
Willing	19	18	20	20	20	97	95.0	90.0	100	100	100	97.0
Not willing	1	2	0	0	0	3	5.0	10.0	0	0	0	3.0

Source: Field survey 2014

Table 4: Consumer's desirability of frog meat in the study area continued

Parameters/ Variables	Frequency						Percentage (%)					
	ARI	BOD	IJAI	MON	OJO	CF	ARI	BOD	IJAI	MON	OJO	%CF
Size preferred with price sold												
Smallest ₦50	2	2	4	3	2	13	10.0	10.0	20.0	15.0	10.0	13.0
Medium ² ₦ 100	8	9	11	9	7	44	40.0	45.0	55.0	45.0	35.0	44.0
Medium ¹ ₦ 150	4	6	4	6	7	27	20.0	30.0	20.0	30.0	35.0	27.0
Biggest ₦ 200	4	2	1	2	4	13	20.0	10.0	5.0	10.0	20.0	13.0
All	2	1	0	0	0	3	10.0	5.0	0	0	0	3.0
For what reason do you acquire frogs												
Own Consumption	17	17	20	20	20	94	85.0	85.0	100	100	100	94.0
For Restaurant/ Hotel	0	0	0	0	0	0	0	0	0	0	0	0
Sales	0	0	0	0	0	0	0	0	0	0	0	0
Consumption & sales	3	3	0	0	0	6	15.0	15.0	0	0	0	6.0
How often consumers acquire frogs												
1 X week	9	12	16	16	12	65	45.0	60.0	80.0	80.0	60.0	65.0
2 X week	3	2	1	0	0	6	15.0	10.0	5.0	0	0	6.0
1 X month	0	1	0	0	0	1	0	5.0	0	0	0	1.0
2 X month	0	2	0	0	0	2	0	10.0	0	0	0	2.0
Occasionally	8	3	3	4	8	26	40.0	15.0	15.0	20.0	40.0	26.0
How often consumers consume frogs												
1 X week	3	9	7	12	7	38	15.0	45.0	35.0	60.0	35.0	38.0
2 X week	10	9	8	6	6	39	50.0	45.0	40.0	30.0	30.0	39.0
Occasionally	7	2	5	2	7	23	35.0	10.0	25.0	10.0	35.0	23.0
If consumers will buy more if they have more money												
Yes	16	14	13	13	14	70	80.0	70.0	65.0	65.0	70.0	70.0
No	4	6	7	7	6	30	20.0	30.0	35.0	35.0	30.0	30.0
If consumers are ready to engage in frog farming												
Yes	4	4	0	2	6	16	20.0	20.0	0	10.0	30.0	16.0
No	16	16	20	18	14	84	80.0	80.0	100	90.0	70.0	84.0
Reason why consumers want to engaged in farming												
Fun and money	0	0	0	0	0	0	0	0	0	0	0	0
Money	4	1	0	2	6	13	100	25.0	0	100	100	81.3
Food and like	0	3	0	0	0	3	0	75.0	0	0	0	18.7

Source: Field survey, 2014

Table 5: Respondent's perception of the population status of frogs in the study area

Respondents	Variables	Arisekola	Bodija	Ijaiye	Moniya	Ojoo	Total	%CF
Traders	Decreasing	0	0	0	0	0	0	0
	Increasing	6	7	5	6	3	27	100
	Static	0	0	0	0	0	0	0
Consumers	Decreasing	5	3	3	2	8	21	21.0
	Increasing	15	17	17	18	12	79	79.0
	Static	0	0	0	0	0	0	0
Cumulative trader and consumers	Decreasing	5	3	3	2	8	21	16.5
	Increasing	21	24	22	24	15	106	83.5
	Static	0	0	0	0	0	0	0

Note: %CF= Percentage of cumulative frequency.

Source: Field survey, 2014

Desirability of frog meat

Frogs were not consumed due to their availability in the markets but because of nutritional (65.0%) and economic (35.0%) reasons (Table 4). Almost all the respondents have consumed frog meat about ten times. The trend of utilization is an indication that frog meat is cherished by consumers and contributes immensely in balancing the animal protein requirement of respondents. Besides, frog meat appears to be among the relatively cheapest form of animal protein (cherished by most consumers) that could be sold in the market within the study area at all times. That could be the reason respondents buy the packs of #100 (136.3 -199.9g) more than that of #200 (300.0g and above). The few respondents (13%) who buys the #200 packs may be those who are relatively richer among the low income earners, and like consuming frog meat for the flavour and nutritional content. It is on the same economic basis that many respondents would want to buy more of frog meat if they had more money. The fact that no respondent utilizes frog meat just because of its availability confirms that it is cherished by all consumers. Consumption of the animal whole is in line with the utilization culture of Africans (for cherished foods) unlike in Europe where only the legs of frogs (Altherr *et al.*, 2011) or the body alone (without the head) are consumed (Mohneke, 2011) or in the case of fish which only the body is utilized and the heads are discarded inside the water body. This also shows that many

consumers consider it as a delicacy like many other bushmeat.

Majority (98.0%) of the respondents prefer it because of its flavour, tenderness and medicinal value. The dried form of frogs is more preferred due to the fact that only dried frog meat were available at the markets in the study area. This is in line with the findings of Mohneke, 2011 and Oduntan *et al.*, 2012. Drying is also the easiest and only available form of preserving frog meat before transporting them from Northern Nigeria to the depots. Frogs are also harvested and processed for consumption in the South East specifically Ebonyi State. When dried the meat becomes easy to package unlike when fresh. Few respondents admitted to have hunted frog species. Those who hunted frogs were respondents who lived in rural area. The possibility of hunting frog is rare in urban areas. This is similar to the report of Ijeomah and Mazi (2015) that non - native consumers of flying winged termite hardly hunt for the species in urban areas but always buy for consumption.

Frog meat is purchased solely for family consumption purpose by many respondents. This shows that frog meat is considered an essential source of protein in various families who consumed it, hence the willingness and enthusiasm to buy more if they had more money. Despite the fact that consumers desired the frog meat coupled with its importance in many households nutrition,

only few respondents were willing to engage in frog farming. This is because they lack the technical-know-how of farming frogs and cannot ascertain the chances of the practice being successful. The few who are willing to be engaged in the farming are only interested in the potential financial benefits from frog farming. This shows that consumers of frog meat are not interested in the conservation of the species.

Perception on population status of frogs

Consumer's knowledge of the high prolificacy of frogs in terms of laying thousands of eggs in ponds, riverbanks and other water bodies gave them the impression that these species are consistently increasing in population. This is because they are unaware of the IUCN conservation status of various frog species. Frogs in the study areas were not hunted and commercialized. The respondents were of the view that scarcity of frogs at certain periods could be as a result of abundance of water (during rainy

seasons), which flood river banks and other water bodies minimizing the efficiency of hunting during such periods. The few respondents (mostly the educated) who perceived that frogs are decreasing are of the opinion that rainy season alone could hardly be the cause of frog's scarcity in the study area but that the large quantity harnessed from the wild (as a result of the trade) will definitely have reducing effect on the population.

CONCLUSION

Frog meat is an essential commodity in the study area. There is high level of awareness concerning its consumptive and non-consumptive utilization but little is known in the area concerning the threatened status of frog species. Awareness should be created by conservation agencies concerning the threatened status of frogs. People should be encouraged by different levels of government to establish frog farms in the study area.

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