

## Gears and Modes of Exploitation of Edible Frogs in the Peri-Urban Localities of Man, Côte d'Ivoire

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### Authors' contributions

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## ABSTRACT

**Aims:** The study carried out aimed to evaluate the modes of exploitation of edible frogs.

**Place and Duration of Study:** The present study was performed during the month of January to February 2022. The survey was conducted in the villages of Kassiapleu, Kouitongouiné and Gbangbéguiné. These villages are located in MAN (West of Côte d'Ivoire).

**Methodology:** Surveys have been carried out among actors exploiting this animal resource. The study involved 210 consumers and 15 frog harvesters in the locality of MAN. A well-structured questionnaire provided data on fishing techniques and frog consumption patterns.

**Results:** This study reveals that there are two main fishing methods: arrow fishing (57.1%) and hook and line fishing (42.9%). The catches are made in different humid ecological zones and the exploitation is only intended for local consumption. The smoked form is the most popular with consumers (59.5%). The majority of respondents consume this meat because of the taste (83.3%) compared to that of chicken (44.8%) and fish (31.4%).

**Conclusion:** In view of these results obtained, the establishment of a rational exploitation strategy must be considered for the conservation of edible frog species.

**Keywords:** Harvesting; frog; conservation; Côte d'Ivoire.

## 1. INTRODUCTION

Frogs are amphibians that are found in nature on all continents. Frogs are now subject to overexploitation by humans either for consumption or for scientific research [1]. In Africa in particular, frogs constitute a very important food resource [2]. Indeed, they represent an essential means of subsistence in rural communities [3].

In several countries including Nigeria, Cameroon, Benin, Burkina Faso, Ghana, Madagascar and Guinea, the trade in frogs is very flourishing and they are used on a large scale as an essential source of animal protein [1]. In the countries such as Nigeria and Burkina Faso in 2010, the number of frogs captured and sold were 2,738,610 and 564,640 frogs respectively. The consumption rate of frog in Ganzourgou (Burkina Faso) during a survey conducted by Mohneke et al. [4] (2010) was 67.0%. More in the southwest region of Nigeria the data is estimated at 43.0% consumption [5]. The craze around this meat in the world would be linked to its organoleptic and nutritional quality. Harvesting of amphibians is often associated with the rural poor supplementing their diet with any available protein [6].

In Côte d'Ivoire, the consumption of frog meat is mainly observed among certain peoples of the west and midwest, notably the Yacouba, Guéré and Wobé. According to the investigation of Blé et al. [3], the general rate consumption of frog in Côte d'Ivoire was 55.2% (563/1020) and varied according to the municipalities, Zoukougbeu (70.3%), Issia (68.3%), Daloa (56.1%). The frog is part of the food habits of these peoples. It is an important source of highly valued animal protein and the species most consumed by these peoples is *Hoplobatrachus occipitalis* [3].

In the peri-urban areas of Man, a city located in the west of Côte d'Ivoire, these frogs are eaten. There is an overexploitation of this resource by the population often leading to its rarity. Most of the frogs consumed are taken from natural stocks. However, the data produced in this area is very limited. Hence the need to carry out this work which aims to provide data on the practice of fishing and consumption.

## 2. MATERIALS AND METHODS

### 2.1 Study Area

The survey was conducted in the Tonkpi region in Western Côte d'Ivoire in three peri-urban localities of the city of Man. Man located in the west of Côte d'Ivoire between 7°24'45"North and 7°33'13" West. The region's climate is subequatorial. This climate is characterized by two seasons which are a rainy season (April to October) and a dry season (November to March). The average annual precipitation is 1632 mm and the average annual temperature varies around 25°C [7].

### 2.2 Survey Method

The survey was carried out from January to February 2022 in three the villages of MAN (Kassiapleu, Kouitongouiné and Gbangbégoniné). Methods of collecting data were face-to-face interviews using standardized questionnaires (written surveys) for 210 consumers and 15 frog fishermen. To facilitate communication, a guide was contacted who sometimes acted as a translator in the local language Yacouba. Respondents were randomly selected from the population. A series of questionnaires have been developed through a survey sheet. The first part of the survey carried out among fishermen focused on information relating to the gear used and the fishing methods and market circuit of frog.

While the second part was made with consumers of frog meat. For consumers, the information took into account the mode of consumption, the form and the preference, and the reasons of frog consumption.

### 2.3 Statistics

The data obtained from the questionnaire were coded and entered into SPSS version 20.0 software for analysis. Descriptive statistics were carried out to determine the variables of interest. The aims parameters such as gears, capture areas, form of frog eaten were used. The results were expressed as frequencies and percentages and exported to Microsoft Excel 2016 to the realization of graph.

### 3. RESULTS

#### 3.1 Gears and Methods of Capturing Frogs

The survey of fishermen in the three villages showed that there are two modes of catching or harvesting frogs: arrow fishing or spearing fishing and fishing with a hook and line.

The fishing method frequently used is arrows fishing which is practiced by 57.1% of fishermen. It consists of the use of 3 to 4 arrows surmounted on a wood which serves as a support (Fig. 1). Spearing technique is done most effectively at night, using a bright spotlight to momentarily daze and immobilize the frog. Afterwards, the fisherman can knock him out or pierce him with the arrow. A torch as bright spotlight attached to the head or in hand, serv as a light. This light helps also to distingue frogs and toads at night. Indeed frogs have light eyes while toads have red eyes at night.



Fig. 1. Instrument used for arrow fishing

Also one of the capture methods mentioned was fishing with a hook and line. This method is practiced only during the day. It was practiced in these villages by 42.9% of the fishermen. The fishing with a hook and line consists of one to three hooks surmounted on a wire or cord of about 1 to 3 m and all connected to a wooden handle. Hooks baited with live insects, earthworms, or flowers of *Leucanthemum vulgare* are dangled in front of the frog.

#### 3.2 Location of Capture Areas and Marketing Circuit of Frogs

The survey results showed that the capture areas of these frogs are wet ecosystems

represented by shallows (53.3%), abandoned ponds (33.3%) and small rivers (13.4%). It should also be noted that the scarcity of frogs was reported by all the fishermen interviewed. During this survey, 73.3% of the fishermen revealed that they caught frogs of small caliber or size. On the other hand, 26.7% of fishermen catch large frogs with a good market value during their campaign. Fig. 2 shows the different frog capture areas.

Concerning the production and trading circuit of frog, the survey reveals that it is simple and informal. Captured frogs are for local consumption only. The frogs once harvested in ponds, rivers and swamps by the collectors, are distributed on the wholesale and semi-wholesale markets. Some collectors sell the frogs directly to consumers. The commercialization of frogs in retail markets is ensured by sedentary sellers and itinerant sellers (Fig. 3). Captured frogs are sold either dried or smoked (Fig. 4).

#### 3.3 Frog Parts Preferences by Consumers

The survey in the three localities showed that frogs were consumed in three forms. Most respondents liked to consume them in the smoked form (59.5%) and in the fresh form (38.1%).

According to the information collected, there is a discrepancy as to the preference of the different parts of the frog. The leg was the part that was the most preferred by the respondents (64.3%). Others, on the other hand, prefer all the parts as well as eggs. They represented 33.3% of those surveyed.

#### 3.4 Reasons for Consumption

It emerges from this survey that the major reason for the consumption of the frog is linked to the taste of this amphibian. Consumers who ate frogs for their taste represented 83.3% of respondents. Other reasons were also mentioned by respondents. The latter mentioned that the frog was either part of their food habit (12.4%) or that they consumed it for pleasure (2.4%) or for lack of meat (2.4%) (Fig. 5). Our investigations have shown that the taste of frog meat is compared to that of several other animals (Fig. 6). According to consumers, the meat closest to frogs is that of chickens (44.8%) followed by fish (31.4%).

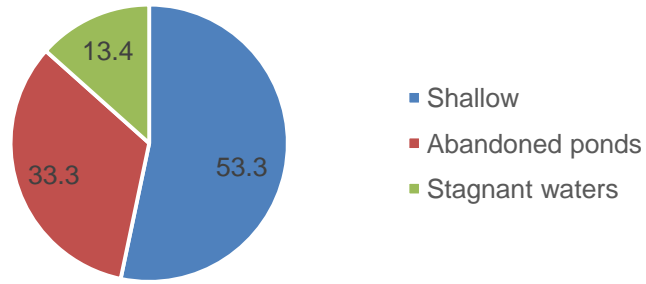


Fig. 2. Different frog capture areas

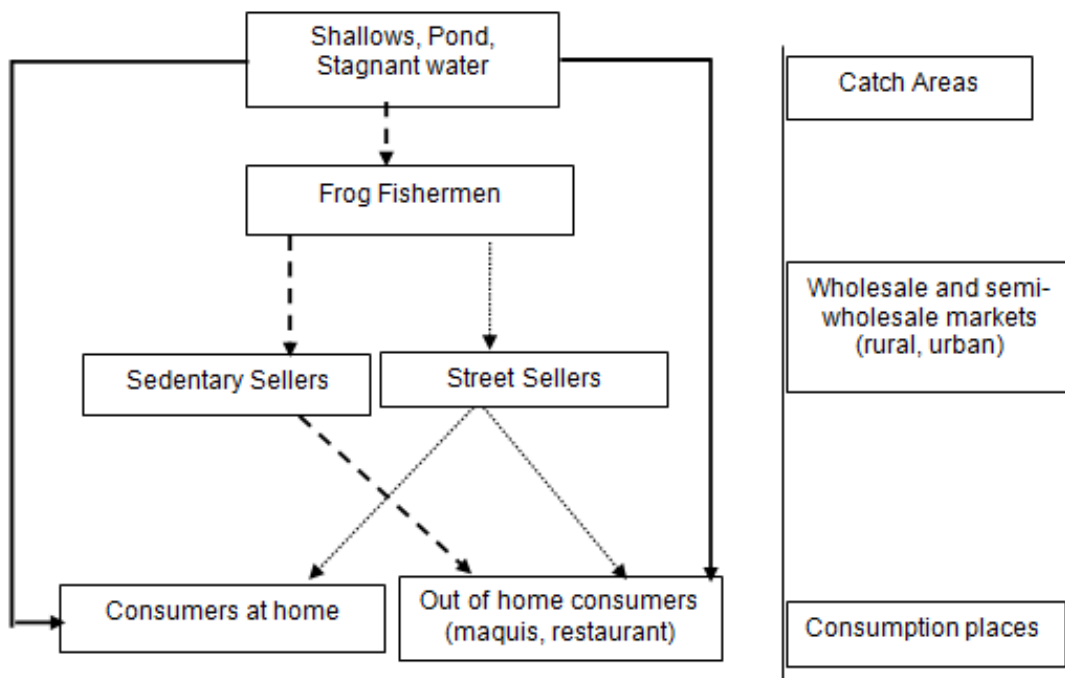
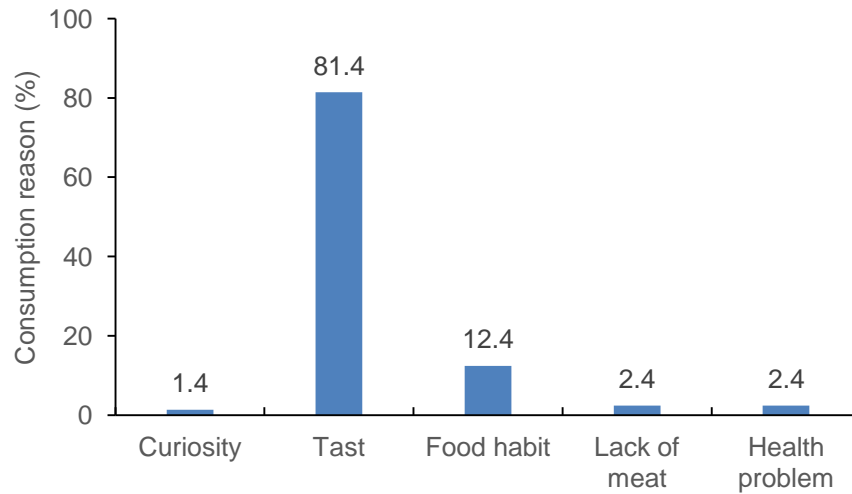


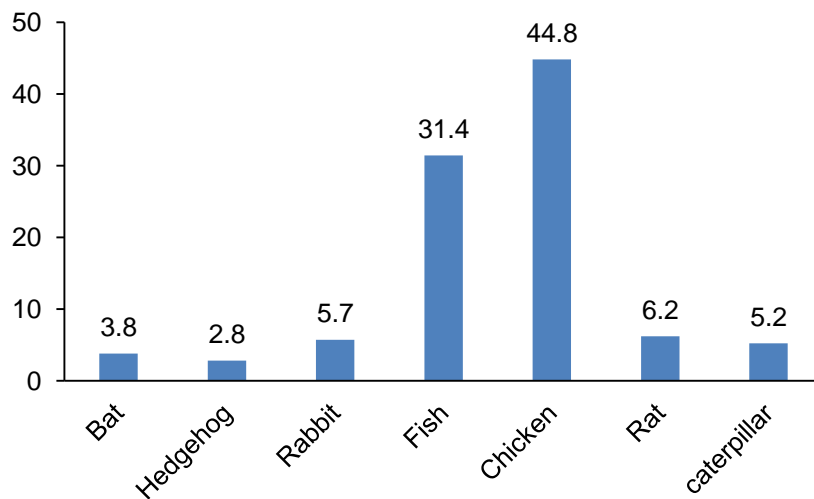
Fig 3. The frog marketing circuit



Fig. 4. Sale of dried frog in the market



**Fig. 5. Reasons of consumption of frog in the localities**



**Fig. 6. Different animals used in the frog taste comparison**

#### 4. DISCUSSION

The survey carried out in the three localities of the commune of MAN showed that the consumption of frogs is real. The marketing channel for frogs is relatively simple and informal. The frogs are caught in wet areas like shallows, pond and swamps. Catches are made either using fishing lines or using an arrow. These different capture techniques are identical to those practiced by fishermen in Daloa [8]. The most common technique used to harvest frogs is arrow harvesting. This is due to the fact that this technique makes it possible to capture a large number of frogs because they are more abundant on moonless nights. It should be noted

that most frog species are more active at night and collecting is usually a nocturnal activity involving handheld or headlamps [6].

This practice has consequences on the natural stock of frogs. Indeed small frogs captured that do not have market value cannot be released into the waters when they are often damaged by arrow. In addition, fishermen have reported that with arrows, breeding females are captured and this reduces production. The use of the arrow causes serious injuries and the integrity of the frog is not preserved. All factors contribute to the decline of frog stocks in shallows, ponds and rivers. Hence the rarity of frogs in these localities.

In Cambodia, Neang [6] also reported the use of wooden traps and harpoon guns, a kind of traditional gun used by hunters to capture frogs. Similarly in Burkina Faso in the province of Ganzourgou, gear such as nets (39.45%) and traps (22.40%) are used as means of catching frogs [9].

The exploitation of frogs in the three surveyed localities aimed to satisfy the local market. This is contrary to the results of work carried out in Benin, Nigeria, Cameroon or Madagascar where the exploitation of frogs is oriented towards external markets or interurban circuits for large hotels [4].

Frog meat was consumed after evisceration without skinning or with skinning. In this study, frogs were eaten either smoked (59.5%) or fresh (38.1%). In Burkina Faso, a survey of 129 consumers showed that the consumption rate of the smoked form was 35% [2].

The frog leg were most appreciated for human consumption (64.3%). Our results are higher than the data (20%) reported by Keita et al. [8]. This attraction for frogs' legs was also mentioned confirmed in the work of Hardouin [9] who stated that in Europe, frogs are mainly consumed as imported Asian legs, thus constituting a sought-after dish. The diversity of preferences in the forms of frog meat consumption (fresh, smoked) reflects the diversity of perceptions that the population has of this animal that is both prized and feared. According to Nzigidahera [10], this mistrust probably stems from the toxins secreted by the toad, which is mistakenly assimilated to frogs.

This study also revealed that the consumption of frogs was also linked to its organoleptic quality which is similar to that of several animals such as chicken (44.8%) and fish (31.4%). Our results corroborate those of several authors who have reported the comparison of frog meat with fish [11] or chicken [12]. According to Altherr et al. [13] it is perhaps in relation to this quality that frog are referred to as "jumping chicken" by consumers in certain countries such as Nigeria and Indonesia.

## 5. CONCLUSION

This study was carried out with the aim of providing scientific data on the mode of capture and consumption of frogs in peri-urban localities of Man. The results showed that the frogs are

captured in the natural environment such as shallows, ponds, small rivers and swamps. Two modes of capture are observed: arrow fishing or spearing fishing and fishing with a hook and line. Frog are eaten smoked form and fresh form by consumers. In view of the abusive exploitation of frogs in these localities, we hope that further studies will performed in breeding frogs in captivity for preservation of the natural stock.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. Hirschfeld M, Rodel MO. The diet of the African Tiger Frog, *Hoplobatrachus occipitalis*, in northern Benin. Salamandra. 2011;(47):125-132.
2. Mohneke M. (Un)sustainable use of frogs in West Africa and resulting consequences for the ecosystem. PhD Thesis, University Berlin. 2011;195.
3. Blé YC, Yobouet BA, Dadié A. Consumption, proximate and mineral composition of edible frog *Hoplobatrachus occipitalis* from midwest areas of Côte d'Ivoire. African Journal of Science and Research. 2016;5(3):16-20.
4. Mohneke M, Onadeko AB, Hirschfeld M, Rödel MO. Dried or fried: Amphibians in local and regional food markets in West Africa. Traffic Bulletin. 2010;(45):193-202.
5. Onadoke AB, Egonmwan RI, Salui JK.. Edible amphibian species: Local knowledge of their consumption in Southwes Nigeria and their nutritional value. West African Journal of Applied Ecology. 2011;19:67-76.
6. Neang T. An Investigation into Frog Consumption and Trade in Cambodia. Fauna and Flora International Cambodia Programme, 2010;25.
7. Ahoussi EK, Keumean NK, Kouassi MA, Koffi BY. "Etude des caractéristiques hydrogéochimiques et microbiologiques des eaux de consommation de la zone périurbaine de la ville de Man : Cas du

- village de Kpangouin (Côte d'Ivoire). International Journal of Biological and Chemical Sciences. 2018;11(6):3018-3033.
8. Keita G, Assemian NE, Zadou ZDA. Status of harvesting, consumption and wild stocks of the edible frog *Hoplobatrachus occipitalis* (Günther,1858) in the city of Daloa (Côte d'Ivoire). Journal of Entomology and Zoology Studies. 2022;10(2):190-196.
  9. Coulibaly ND, Zigué B. Exploitation et traits de menaces des grenouilles d'un intérêt socio-économique dans la province du Ganzourgou au Burkina Faso, Afrique de l'Ouest. International Journal of Biology and Chemical Science. 2021;15(3):1090-1103.
  10. Hardouin JA. Bull-frog rearing enterprise in the Philippines. (Un élevage de grenouilles-tareaux aux Philippines). Tropicultura. 1991;9(1):34-36.
  11. Nzigidahera B. Note sur *Hoplobatrachus occipitalis* (Günther), espèce comestible au Burundi. Institut National pour l'Environnement et la Conservation de la Nature (INECN), Burundi. Bulletin Scientifique de l'Institut National pour l'Environnement et la Conservation de la Nature. 2006;1:1-14.
  12. Akinyemi A, Ogaga RD. Frog Consumption pattern in Ibadan, Nigeria. Journal for Studies in Management and Planning. 2015;1:522-531.
  13. Altherr S, Goyenechea A, Schubert D. Canapes to Extinction: The International Trade in Frogs' Legs and its Ecological Impact. Pro Wildlife, Defenders of Wildlife and Animal Welfare Institute (eds.): Munich (Germany)-Washington D.C. (USA); 2011.

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