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# A Survey on Entomophagy Practice of the Armoured Cricket (*Acanthoplus discoidalis*) in Mashonaland Central, Zimbabwe

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**ABSTRACT**

*Entomophargy of different insect species is practiced throughout Zimbabwe. The baseline survey study carried out in this research was done in order to document entomophagy of the armoured cricket (Acanthoplus discoidalis) which is practiced in Mbire District of Mashonaland Central Province, Zimbabwe. Information that includes harvesting technique, preparation and preservation of the armoured cricket in this district was collected. Forty six households that consumed the armoured cricket were identified using the snow ball sampling technique. From these, 91 respondents were interviewed. Data collected was encoded and analysed using SPSS. Most of the respondents 60.4% were females, and most of the respondents were of the >45 age group. It was observed that 72.5% of the respondents consumed A. discoidalis as a relish substituting meat whilst 19.8% consumed it for enjoyment purposes as a snack. The insects were observed to be predominantly harvested by handpicking from the wild. A series of boiling stages would then follow prior to degutting. After this the insects were shallow fried and the consumed as a substitute to meat or as a snack. Other insects are consumed in Mbire District for example, winged and soldier termites, but these are not consumed as frequently as the armoured cricket. Since this insect is a popular food resource for the locals, the nutritional value and health risks associated with the insect should be studied.*

***Key words:*** *Entomophagy, Acanthoplus discoidalis, Harvesting, Preperation*

## INTRODUCTION

Entomophagy is important in ensuring food security in Zimbabwe. More than 40 insect species have been reported to be consumed in the country[1]. Insects are considered healthy and nutritious because of their macro and micro nutrient quality[2,3,4,5]. It has been reported that access to protein world over has improved considerably since 2015 due to the consumption of insects[6] hence it is important to use these as a means of improving the nutritional status of marginalised societies in rural Zimbabwe. Considering that the Zimbabwean population is projected to almost double from13.1 million to 19.3 million in 2032[7], it is imperative to advocate for insect consumption as a means of ensuring food security.

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Edible insects have gained recognition as valuable food resources capable of complementing efforts to feed the increasing global population[8,9,10].

Mbire District of Mashonaland Province, Zimbabwe is a rural community. Most of the inhabitants of this District engage themselves in communal farming practices and also practise entomophagy. The armoured cricket *Acanthoplus discoidalis* is from the order Othoptera and observations made were that it is considered an important food supplement and often as a delicacy by those who consume it in the District. No other insect species is consumed as frequent as the armoured cricket. These crickets are natively known as *Mamunye* or *Magomba.* The insect is mostly harvested and consumption done mainly during the period March to June. The species is found throughout the country and is also native to South Africa, Botswana and Namibia[11,12]. No information to date exists on entomophagy practice of the armoured cricket in Zimbabwe. This study documents the harvesting techniques, preparation and preservation methods of armoured crickets that are done in Mbire District. The information gap that exists on armoured cricket entomophagy appears to make this valuable resource underutilised. This document intends to set the stage for other studies related to nutritional and safety evaluations of armoured cricket consumption.

## MATERIAL AND METHODS

### Study Site and Data Collection

The study was carried out in Mbire District which has an estimated population of 82 380[7]. Mbire District has 17 wards/local administrative geographical boundaries. The District is characterised by a dry, tropical climate with temperatures which can range up to 40°C in summer and low rainfalls averaging 450-650 mm annually[13]. Much of the population is dependent on communal farming (personal observation). In Mbire *A. discoidalis* are abundant and also considered as a valuable food item (T. Meki 2017, personal communication, 13 February). The Snow ball sampling technique was used to identify households that consumed the armoured cricket, 46 households participated in this study. Averages of 2 respondents were interviewed per household. Coordinates for households from which information was sourced were recorded. Figure 1 below shows the location of households that participated in the survey.

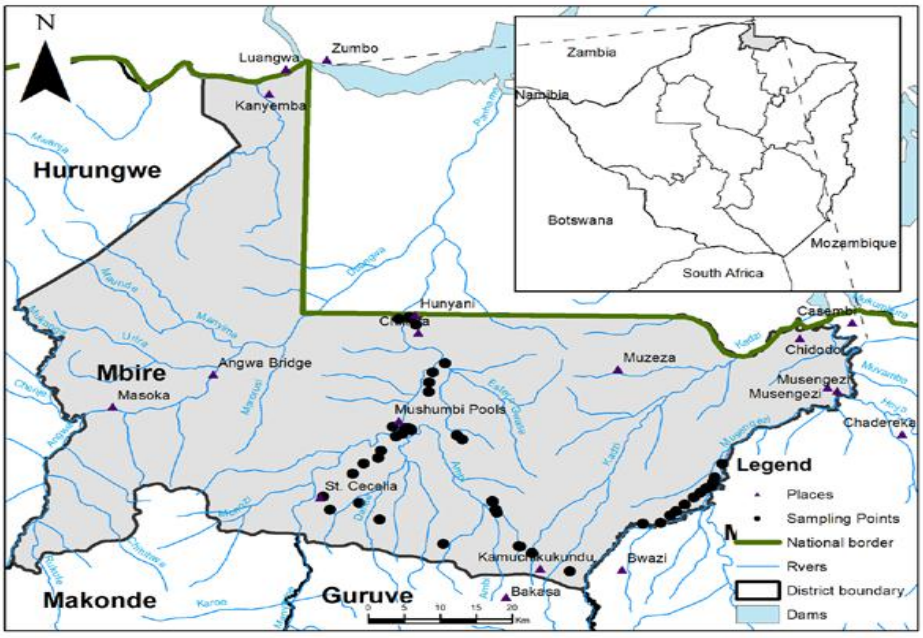


**Figure 1**: Location of Mbire District in Mashonaland Central Province, Zimbabwe with specific sampling points.

Face to face interviews on all 91 respondents were conducted in Shona (a local language) and responses written in English. Data was collected on sex, age, educational level of respondents and employment status, harvesting techniques, insect host plants, processing for human consumption and preservation, and time of availability of insects, reason for consumption, frequency of consumption and quantities consumed in a single sitting.

**Data Analysis**

Data was encoded and entered into SPSS version 24 and analysed. Tables were used to present summary statistics such as frequencies and percentages. A Simple $\chi^2$ test was used to test if there was a relationship between employment level and frequency of consumption and also to test if they was a relationship between education level and frequency of consumption.

## RESULTS AND DISCUSSION

**Socio-economic Data of Respondents**

Table I below shows the socio-economic data of the respondents that participated in the survey. Most of the respondents 60.4% were females, and most of the respondents (38.5%) were of the >45 age group. Eighty six comma three percent of the respondents had no formal employment.

**Table 1**: Socio-economic Data of Respondents

| Category | Respondents (n=91) | % Responses |
|---|---|---|
| **Sex** | | |
| Male | 36 | 39.6 |
| Female | 55 | 60.4 |
| **Age Group (Years)** | | |
| 18-25 | 12 | 13.2 |
| 26-35 | 25 | 27.5 |
| 36-45 | 19 | 20.8 |
| >45 | 35 | 38.5 |
| **Education** | | |
| Primary | 12 | 13.2 |
| Secondary | 58 | 63.7 |
| Tertiary | 17 | 18.7 |
| None | 4 | 4.4 |
| **Source of Income** | | |
| Employed | 12 | 13.2 |
| Unemployed | 79 | 86.8 |
| **Reason for consumption** | | |
| Substitute to meat | 66 | 72.5 |
| Enjoyment | 18 | 19.8 |
| Custom | 7 | 7.70 |
| **Preparation Method Preferred** | | |
| Method 1 | 72 | 79.1 |
| Method 2 | 19 | 20.9 |
| **Frequency of consumption** | | |
| Once a week | 16 | 17.6 |
| Twice a week | 21 | 23.1 |
| > Twice a week | 54 | 59.3 |
| **Quantities Consumed in a Sitting** | | |
| 1 cup | 43 | 47.3 |
| 1/2 cup | 38 | 41.8 |
| < 1/2 cup | 9 | 9.9 |

It was observed that 72.5% of the respondents consumed *A. discoidalis* as a relish substituting meat whilst 19.8% consumed it for enjoyment purposes as a snack. There was

a relationship between education level and frequency of consumption ($\chi^2$ = 134.99, df- = 6, $p < 0.05$).There was also a relationship between level of employment and frequency of consumption ($\chi^2$ = 137.192 df- = 2, $p < 0.05$).

**Harvesting**

*A. discoidalis* is seasonally available during and immediately after the rainy season i.e., January to May. Because the crickets are abundant in the district, harvesters do not need to travel long distances to access harvesting points. Most of the insects were harvested from field crops. The armoured crickets are entirely handpicked during their adult stage of growth from crop fields and from vegetative outgrowth where they occur in numbers. It was observed that prolonged harvesting times prior to processing could result in the insects becoming cannibalistic resulting in postharvest losses. The insects are handled gently so as to avoid the release of haemolymph which is pale yellowish-green in colour, acrid-smelling, and distasteful. Care is taken also when handling the armoured crickets as they are equipped with sharp spines on the thorax and they possess a bite force that is strong enough to draw human blood. Men, women and children were involved in the collection however the contribution by men was low as they would be involved in other activities. This observation is similar to that done in Sekoma[14], in which men did not participate much in insect harvesting as they were involved in other activities such as livestock production. After the insects are collected and placed into buckets whilst still in the live form, they are then taken for processing.

**Preparation and Preservation**

Live insects are placed in metal pots and water added to the brim. The pots are then placed on open fire and allowed to boil. Twenty percent of the respondents opt to decant the water after some time of boiling after which they repeat the boiling process. This cycle is repeated at least three times up until the insects have assumed an ox-red colour as shown in Figure 2 (Method 1).

**Figure 2**: Colour changes that occur before during and after boiling of Armoured crickets.

Repeated boiling has been found to assist in the reduction of some anti-nutrients found within *Eulepida mashona*[15]. Other respondents, after water has been added to the brim opt to boil the insects up until the water is almost finished then more water is added to fill up the pot. The cycle is repeated at least three times after which when the water is almost finished it is decanted (Method 2).

After the boiling process, the dead insects are allowed to cool after which the head, spiny thorax and entire gut and its contents are removed by pulling the abdomen from the thorax. The head, spiny thorax and entire gut are discarded. The consumer can either choose to cook or preserve the boiled insects. During the cooking process, the remaining abdomen is shallow fried using vegetable oil for about 15 minutes during which salt and spices may be added. After the frying process the insects will be ready for consumption. The insects can be consumed as snacks or served as a substitute to meat. Sun drying is done to preserve the boiled insects. The preserved insects can then be boiled for 20 minutes and shallow fried for

consumption purposes when necessary after the drying process.

***A. discoidalis* Host Plants**

It has been reported that the host plant diet has potential influence on the nutritional profiles of edible insects[16,15]. Table 2 below lists the plant species from which *A. discoidalis* was harvested by respondents who took part in the survey.

**Table 2: Host plant description from field observations**

| | Local Name | Scientific Name |
|---|---|---|
| **Field Crops** | Mapfunde | *Sorghum bicolour* |
| | Chibage | *Zea mays* |
| | Nyemba | *Vigna anguiculata* |
| | Fodya | *Nicotiana tobacum* |
| **Trees/Bushes** | Nhundurwa | *Solanum incanum* |
| | Muzambiringa | *Ampelocissus africanus* |
| | Muzunga | *Acacia nilotica* |
| | Munhunguru | *Flacourtia indica* |

*A. discoidalis* has been reported to be an opportunistic feeder[17] hence its host plants vary widely. Most of the insects were however harvested from field crops. The armoured cricket has been reported to be a pest to field crops[18]. Table 3 below shows a list of other insects that are consumed by locals in Mbire. Some of these insects are also consumed elsewhere in Zimbabwe[19].

**Table 3: Other Insects Consumed in Mbire District**

| Local Name | Scientific Name | % Respondents |
|---|---|---|
| Majuru | *Macrotermes sp.* | 100 |
| Ishwa | *Macrotermes sp.* | 100 |
| Majenya | *Henicus whellani* | 59.3 |
| Madora | *Imbrasia belina* | 100 |
| Whiza/Mhashu | *Locusta migratoria* | 80.2 |
| Nyenze | *Loba leopardina* | 27.5 |
| Mandere | *Eulepida mashona* | 5.5 |
| Harurwa | *Encosternum delegorguei* | 25.3 |
| Magure | *Brachytrupes membranaceus* | 34.1 |

**Health Risks Associated with Entomophargy of *A. discoidalis***

Sixty three respondents reported that if the armoured cricket is not prepared properly causes adverse health effects. They cited the boiling stage as being critical during processing. They also mentioned that preparation of the insects prior to consumption required time and experience. Three respondents reported that they once had difficulties micturating after consumption of crickets that are not properly processed but however, the effects subsided after some hours. Two respondents reported that they once suffered from skin rushes. It was also reported that some individuals may also produce blood stained urine though no respondents who participated in this survey had ever experienced this disorder. Edible insects are known pose allergy, microbial, parasitical and chemical hazards which give rise to adverse health effects[20]. Apart from the adverse health effects some respondents

mentioned that the insect is an aphrodisiac which can be used by men.

## CONCLUSION

*A. discoidalis* is an insect species that is consumed in Mbire District. The insect is seasonally available to locals. Since this insect is a popular food resource, the effects of processing and preservation on the nutritional value and health risks associated with consumption of the insect should be researched on.

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