Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 7, Issue, 10, pp.21511-21514, October, 2015

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

MICROBIOLOGICAL AND NUTRITIONAL QUALITY OF *CYMBIUM GLANS* FROM QUA IBOE RIVER ESTUARY, NIGERIA

[1,*]Udotong, J. I. R. and [2]Ukot, C. A.

[1]Department of Biochemistry, University of Uyo, Uyo, Akwa Ibom State, Nigeria
[2]Department of Microbiology University of Uyo, Uyo, Akwa Ibom State, Nigeria

ARTICLE INFO

Article History:
Received 04th July, 2015
Received in revised form
05th August, 2015
Accepted 27th September, 2015
Published online 31st October, 2015

Key words:
Cymbium glans,
Microorganisms,
Protein Energy Malnutrition
(PEM), Proximate Analysis,
Public Health, Qua Iboe River Estuary.

ABSTRACT

Qua Iboe River estuary is one of the three estuaries in Niger Delta region, Nigeria. Huge petroleum exploration and production activities go on, placing the country as the 8th largest oil producer in the world. The residents are poor, show symptoms of PEM, thus depending on sea foods as their major source of protein. *Cymbium glans,* a marine snail is commonly consumed in the area. Microbiological, nutritional and trace elements of *C. glans* from QIR estuary were investigated. While total heterotrophic bacterial count of gut and tissue of this organism ranged from $1.6x10^6$ to $1.8x10^6$cfu/g and $9.5x10^5$ to $1.0 x10^6$cfu/g, respectively; the total coliform counts ranged from $3.5x10^5$ to $2.0 x10^6$ cfu/g and $5.5x10^5$ to $8.5 x10^5$ cfu/g from the gut and tissue, respectively. Fungal counts from the gut ranged from $5.5 x10^5$ to $6.5 x10^5$cfu/g and from $4.5x10^5$ to $5.0x10^5$ cfu/g for tissue. Proximate analysis revealed that *C. glans* had 76.05 - 77.79% moisture, 6.06 - 7.84% ash, 59.15 - 61.25% protein, 4.25 - 4.75% lipid, 6.74 - 22.46% carbohydrate, amongst others. Calcium, zinc and iron levels exceeded the recommended limits set by USDA. *C. glans* is not wholesome and harbours some microorganisms of public health significance, though nutritionally rich.

***Citation*:** Udotong, J. I. R. and Ukot, C. A. 2015. "Microbiological and nutritional quality of *Cymbium glans* from qua Iboe river Estuary, Nigeria", *International Journal of Current Research*, 7, (10), 21511-21514.

INTRODUCTION

Qua Iboe River (QIR) estuary receives unregulated wastes stream from Exxon Mobil's Qua Iboe Terminal (QIT). According to Udotong (1995), petroleum production effluent or produced water from QIT contains trace elements as well as microorganisms. These trace elements pass through the food chain to humans when ingested, posing public health problems. Bioaccumulation of these trace metals and other contaminants by bivalves has been established (Udotong, 2004) (Thesis-University of Calabar, Nigeria) and is said to be a function of their sizes, age, filtration rate and reproductive status but also vary with environmental factors (Oze *et al*., 2006). Pollution of marine ecosystem by trace elements particularly from petroleum E&P activities is of global environmental concern (Udotong, 1995) although elements in trace constituents are normal constituents of marine organisms. At high levels they are potentially toxic and may disrupt biological activities of aquatic ecosystem. When trace elements are incorporated in biological tissues at abnormally high doses, they can be classified as toxic metals (Udotong, 2004) (Thesis-University of Calabar, Nigeria).

Corresponding author: Udotong,
Dept of Biochemistry, University of Uyo, Uyo, Akwa Ibom State, Nigeria.

With the ongoing global economic recession in most developing countries, there is a serious threat of protein energy malnutrition (PEM) and mal-nourishment (Udotong and Sokari, 1998; Sokari and Udotong, 1998). Protein is in short supply and the protein intake of the people is far below the recommended daily average (Newman *et al.,* 1972). Protein deficiency diseases are therefore very rampant. There is therefore the need for readily available and cheap protein–rich sources.

Seafoods in general and shellfishes in particular have been identified as a rich protein substitute to conventional animal protein sources (Udotong and Sokari, 1998; Sokari and Udotong, 1998; Umoh *et al.*, 1980; Umoh and Bassir, 1977). Much work have been on *Egaria radiata* (Udotong, 2004) (Thesis-University of Calabar, Nigeria); Ifon and Umoh, 1987); Periwinkle (Udotong and Sokari, 1998; Sokari and Udotong, 1998; Umoh and Bassir, 1977), *Thais califera* (Udotong and Sokari, 1998) and *Uca pungnax* (Sokari and Udotong, 1998). *Cymbium glans*, commonly known as the elephant's snout volute, is a species of sea snail, a marine gastropod molluscs in the family Volutidae (http://en.wikipedia.org). It is one shellfish that has been widely consumed by the people of Ibeno, Nigeria in Africa in particular and in most other

countries and continents of the world like Asia, America, etc in general but very little is known about its quality. There is paucity of information on the microbiology, nutritional quality and heavy metals content of *C. glans* from QIR estuary. Moreover, Douglas creek from where *C. glans* samples were harvested receives petroleum production effluent (PPE) from Mobil Producing Nigeria Unlimited (MPNU), the largest crude oil producer in Nigeria and the largest condensate producer in Africa (Udotong, 1995). This work describes the microbiological and nutritional quality of *C.glans* from QIR estuary with a view to recommending its conservation and consumption.

MATERIALS AND METHODS

Collection and Treatment of Samples

Samples of *C.glans* (Fig. 1) harvested from the mangrove swamps of the Lower QIR estuary were collected into labeled sterile containers. The samples were transported to the laboratory for analysis

Fig. 1. *C.glans* from Qua Iboe River estuary, Ibeno, Nigeria

C. glans samples for microbiological analyses were thoroughly washed with distilled water and weighed. They were cracked with a sterile hammer on a sterile surface (sterilized with alcohol and allowed to dry). It was dissected to separate the gut from the edible muscle tissue. The gut and muscle were then homogenized separately using a sterile crucible mortar and pestle.

Microbiological Analysis

(a) Serial Dilution: Ten–fold serial dilutions of the samples were carried out according to the methods of Harrigan and McCance (1976).

(b) Inoculation and Incubation: One milliliter (1.0ml) of appropriate dilutions of the samples were inoculated onto appropriate nutrient media, using pour plate technique of Harrigan and McCance (1976), in duplicates. One set of the inoculated plates were incubated at 37^0C for 18 – 24h while another set were incubated at ambient (room) temperature (28 ± 2^0C), for 48-72h. Visible discrete colonies in incubated plates were counted and multiplied by the reciprocal of the dilution factor and expressed as colony forming units per gram (cfu g^{-1}).

(c) Maintenance of Pure Culture: Discrete colonies were purified by repeated subculture onto appropriate nutrient media. Pure cultures were preserved on nutrients media slants and stored in the refrigerator (4^0 C – 8^0 C) until needed for further tests.

(d) Characterization and Identification of Microbial Isolates: Pure cultures of microbial isolates were characterized using standard methods as described by Cruickshank *et al* (1975), Identification of the bacterial isolates was accomplished by comparing the characteristics of the cultures with that of known taxa using Bergey's Manual of Determinative bacteriology of Buchanan and Gibbons (1974). The probable identities of moulds were determined according to the methods of Domsch and Gams (1970). The yeast isolates were identified using the schemes described by Barnett and Pankhurst (1974).

Nutritional Quality Determinations

Moisture, crude protein, fat, fiber and ash contents of *C. glans* were determined according to the methods of Association of official Analytical Chemist, AOAC (AOAC, 1975). Carbohydrates contents were calculated by difference while the energy contents were obtained by multiplying the protein, fat and carbohydrate contents by factors 4, 9, and 4, respectively and summing them together (AOAC, 1975).

Trace Elements Analysis

The fleshy edible (meat) portions of *C. glans* were digested using the mixed acid digestion method of the AOAC (AOAC, 1975). The digests were aspirated directly into Atomic Absorption Spectrophotometer, AAS (Pye Unican 919 model) with appropriate cathode lamps and wavelengths for each metal. The results of the analysis were recorded as R in the readout column of the instrument and later converted to mg l^{-1} (ppm) using the formula.

$$\text{Mg } l^{-1} \text{ (ppm)} = (R \times D \times V) / Wt \quad \ldots\ldots\ldots\ldots\ldots 1$$

Where D is the dilution factor; V is the volume of digest prepared, and Wt is the weight of *C. glans* originally taken for the digestion.

RESULTS AND DISCUSSION

Microbial Counts

Microbial counts of the gut and tissue of *C. glans* from QIR estuary are as presented on Table 1 below.

Table 1. Microbial Counts of the Gut and Tissue of *C. glans* from QIR Estuary

Sample	*C. glans* Characteristics			THBC		TCC		TFC	
	Wt (g)	LF (cm)	LS (cm)	Gut ($x0^6$)	Tissue ($x0^5$)	Gut ($x0^5$)	Tissue ($x0^5$)	Gut ($x0^5$)	Tissue ($x0^5$)
1	594.4	17.0	19.0	1.8	9.5	20	5.5	5.5	4.5
2	330.5	12.5	16.0	1.6	10	3.5	8.5	6.5	5.0

Wt. – Weight; LF – Length of foot; LS – Length of shell; THBC – Total heterotrophic bacterial count; TCC – Total coliform count; TFC – Total fungal count.

Table 2. Proximate Composition of *Cymbium glans*

Sample	Moisture (%)	Ash (%)	Protein (%)	Lipid (%)	Cho (%)	Fibre (%)	Calorie (Kcal)
Sample 1	76.05	6.06	61.25	4.25	6.74	6.9	310.21
Sample 2	77.79	7.84	59.15	4.75	6.65	5.8	369.19

Table 3. Trace Elements of *C. glans* from Qua Iboe River, Nigeria

Samples	Trace Elements (mg/100kg)				
	Ca	Zn	Cu	Mg	Fe
Sample 1	239.25	53.58	3.15	108.03	355.63
Sample 2	227.95	75.38	2.33	96.03	347.90
USDA Stds	10.0	1.00	0.40	250	3.50

The results obtained reveal that the THBC of the gut ranged from $1.6x10^6$ to $1.8x10^6$ cfu/g, while the TCC and TFC ranged from $3.5x\ 10^5$ to $2.0x\ 10^6$ cfu/g and $5.5\ x\ 10^5$ to $6.5\ x\ 10^5$ cfu/g, respectively. The THBC of the tissue ranged from $9.5x10^5$ to $1.0x10^6$ cfu/g while TCC and TFC ranged from $5.5\ x\ 10^5$ to $0.85x\ 10^6$ cfu/g and $4.5x10^5$ to $5.0x\ 10^5$ cfu/g, respectively. Apart from the values of THBC and TCC in the gut, all other parameters in sample 2, the smaller in size and weight and probably the younger, were found to be higher than the values in the bigger and probably the older one. The high microbial counts of this shellfish in general and high total coliform counts in particular (Table 1) gives an indication of unwholesomeness (ICMSF, 1978). It is important to note that there has been no established microbiological standard for *C. glans* from QIR estuary, Ibeno in particular and the Nigerian coastal waters in general.

The Microbial Isolates

The microbial isolates from the gut and tissues of *C.glans* from QIR estuary were identified as *Bacillus* sp, *Listeria* sp, *Micrococcus* sp, *Salmonella* sp., *Acetobacter* sp, *Streptococcus* sp, *Planococcus* sp and *Marinococcus* sp. The fungal isolates were *Aspergillus* sp, *Rhizopus* sp, *Penicillum* sp, *Geotrichium* sp and *Candida* sp. From the above, *C. glans* from this estuary is not wholesome and harbours some microorganisms of public health significance. The presence of enteric bacteria like *E. coli* and *Salmonella* sp., is a major cause for concern because of its public health implications: they are capable of causing food borne diseases.

The health implication of organisms such as *Listeria* and *Escherichia coli* cannot be over emphasized. *Listeria* is responsible for a food-borne disease known as Listeriosis. *Escherichia coli* can cause illness with symptoms of diarrhea and nausea within 12 to 24 hours of ingestion. The detection of *E.coli* from the samples is indicative of recent faecal contamination of the environment. The samples used in this work were harvested from the lower QIR estuary which receives unregulated sewage from the residents of fishing settlements as well as effluents from MPNU. The lower QIR estuary receives effluent from Mobil Producing Nigeria Unlimited, MPNU (the largest Oil Producing Company of Nigeria and the largest condensate producer in Africa). The pollution status of this environment (the lower QIR estuary) has been monitored and found to be quite high (Udotong, 2000; Udotong and Sokari, 1998; Sokari and Udotong, 1998; Udotong *et al*, 1997).

Nutritional Quality of *C. glans*

The results for the proximate nutrient composition of *C. glans* are shown in Table 2. *C.glans* from QIR estuary, Nigeria had protein content of 61.25% and 59.15% while their calorific values were 310.21 Kcal and 369.16 Kcal, respectively. When compared to conventional protein sources like egg, meat, etc, the protein contents of *C. glans* analyzed were found to be higher.

Trace Elements Contents of *C. glans*

Table 3 shows the trace elements content of *C. glans* from QIR estuary, Nigeria. From the above, *C. glans* is rich in calcium and other trace elements required by the body. This high Ca content has great health benefits for persons with high calcium requirements such as children and lactating mothers. When compared with the USDA standards, trace elements in *C. glans* from QIR estuary were higher except Mg. Effective utilization of this protein rich shellfish is therefore recommended to improve the protein intake of the rural peasant populations usually vulnerable to protein energy malnutrition (PEM) deficiency syndrome (Umoh *et al*., 1980).

REFERENCES

Association of official Analytical Chemist, AOAC 1975. Official Methods of Analysis. Association of Official Analytical Chemist, Washington, D.C

Barnett, J.A. and Pankhurst, R.J. 1974. A New Key to the Yeasts, North Holland Publishing Co. Amsterdam, the Netherland

Buchanan, R.E. and Gibbons, N.E. 1974. Bergey's Manual of Determinative Bacterilogy (8th Ed). William and Wilkins Co., Baltimore, Maryland.

Cruickshank, R., Duguid, J.O., Marmoin, B.P. and Swain R.H. A.1975. Medical Microbiology (Vol. 2) Churchill Livingstone, London.

Domsch, K.H. and Gams, W. 1970. Fungi. In: Agricultural Soils. Longmann Group Ltd., London

Harrigan, N.E. and MaCance, M.E. 1976. Laboratory Methods in Food and Diary Microbiology. Academic Press London.

Ifon, N.T. and Umoh, I.B. 1987. Biochemical and Nutritional Evaluation of *Egaria radiata,* A Delicacy of some Riverine Peasant Populations in Nigeria. *Food Chemistry*, 24:21 – 27.

International Commission on Microbiological Specification for Foods (ICMSF). 1978. Microorganisms in Foods 1 (2nd Ed.) University of Toronto Press, Toronto.

Newmann, D.A., Benenson, M.W. and Lee, J.V 1972. Vibrio *parahaemolyticus* in the Republic of Vietman. *American Journal of tropical Medicine and Hygiene,* 21:404 – 409

Oze, G.O., Oze, R.N., Ananuso, C.O. and Nwanjo, H. (2006). Metal Pollution of Fish of Qua Iboe River Estuary: Possible Implications. *Nigerian Journal of Biochemistry and Molecular Biology,* 24(2)**:**1-5.

Quality and Heavy Metals Content of *Uca pugnax from* Ibeno Beach, Eket, Akwa Ibom State. *Trop. J. Env. Sc. & Technol.,* 2: 11 -17.

Sokari, T.G. and I.R. Udotong. 1998. Towards Total Conservation and Utilization of Aquatic Resources from Lower Qua Iboe River Estuary, *II. Microbiology*, Nutritional

Udotong, I.R. 1995. Petroleum Exploration and Production (E & P) derived waste stream management in the Nigerian oil industry. *Journal of Sc. Engineering and Technology,* 2 (2): 201 – 21.

Udotong, I.R. 2000. Environmental monitoring and effect of petroleum production effluent on some biota of the lower Qua Iboe river estuary. Ph.D thesis, University of Science and Technology Nkpolu-Oroworukwo, Port Harcourt, Nigeria, 295pp.

Udotong, I.R. and Sokari, T.G. 1998. Towards Total Conservation and Utilization of Aquatic Resources from Lower Qua Iboe River Estuary. I. Microbiology, Nutritional Quality and Heavy Metals Content of *Thais callifera* from Itak Abasi Creek, Akwa Ibom State, Nigeria. *Trop. J. Env. Sc. & Technol.*, 2: 4 - 10.

Udotong, I.R., Udoessien, E.I. and Sokari, T.G 1997. Akwa Ibom State coastal zone management (AKSCZM) framework: A need for sustainable development. *Trop. J. Environ. Sc. & Tech.,* 1:3 - 15

Umoh, I.B. and Bassir, O. 1980. Composition of Food: Raw, Processed and Prepared. Agricultural Handbook No.8, V. S. Department of Agriculture Washington D. C.

Umoh, I.B., Ayalogu, E.O., and Bassir, O. 1980. Evaluation of the Nutritive Value of Some lesser – known Protein Sources in Nigeria Peasant Diets. *Ecology of food and Nutrition,* 1:23 - 28

****