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ASSESSMENT OF EDIBLE CRAB HARVESTING AND CONSUMPTION IN SOUTHERN CROSS RIVER STATE, NIGERIA

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ABSTRACT

Assessment of the harvesting and utilization of edible crabs was carried out to identify species harvested and their seasonality, harvesting equipment, constraints of harvesting and consumption as well as distribution outlets in Southern Cross River State, Nigeria. A purposive sampling technique was used to select six fishing ports in two Local Government Areas; three in Akpabuyo and three in Bakassi using questionnaire (n=90). Data generated were analyzed descriptively using frequency of counts, percentages, means, bar diagrams and Likert Scale. Crab harvesters were solely males (100.00%) and mostly in the range 0f 31-40 years (43.33%). The activity is associated with high level of illiteracy (50.00%). Most harvesters (42.20%) had 11-20 years of experience in the activity. Response on crab abundance in the study shows that Cancer pagurus (46.67%) > Scylla serrata (31.11%) > Callinectes amnicolla (13.33%) > Patamon fluviatile (8.89%). Though, the dry season is the preferred period of harvesting, there is no significant difference between the dry and wet seasons in relation to crab harvesting. Harvesting equipment were nets (47.00%) < basket (39.00%) < bamboo cage (9.00%) < crab pots (5.00%). Consumption outlets were Cross River State (45.00%), other states (31.00%), neighbouring countries (24.00%). Lack of modern storage facilities (3.7), illiteracy (3.6), seasonality (3.3) and modern harvesting equipment (3.1) were among the challenges of sustainable crab harvesting in the area of study.

Key words: Edible crab, harvesting, consumption, constraints, equipment.

INTRODUCTION

Crab belongs to the group of shellfish called crustaceans, and identified by their hard shells, five pairs of legs; making them decapods. It has been reported that crabs and other crustaceans account for about one-fifth or twenty percent of all the foods obtained from the seas, rivers, lakes and other aquatic sources (Udo and Arazu, 2012). Crabs make up about twenty percent of all marine crustaceans consumed worldwide (Elegbede and Fashina-Bombata, 2013). Over one hundred species of crabs are known with blue crabs (*Callinectes amnicola*) being the most commonly consumed in the world (Omotayo *et al*., 2013). Crab is used in a wide variety of dishes including salads, soups, starters, or served as a main course. The taste, texture and nutritional benefits of crab meat make it a versatile delicacy all over the world. In a country where the protein gap is very high coupled with rising cost of conventional sources of animal protein, crab meat has the potential to cover this protein gap in the Nigerian populace (Ubesie and Ibeziakor, 2012).

The crab meat is nutritionally valuable as a rich source of high quality protein, minerals and vitamins (Adeyeye, 2002; Skonberg and Perkins, 2002; Omotayo *et al*., 2013) with low levels of fat and carbohydrates (Udo and Arazu, 2012). A report of the Shellfish Association of Great Britain shows that the protein in shellfish (Crabs inclusive) is high in essential amino acids and is highly digestible because of the lack of connective

tissue. The minerals found in abundance in crab include calcium, copper, zinc, phosphorus and iron (Adeyeye, 2002), with less amounts of chromium and selenium. Crab is also a rich source of the fat-soluble vitamins A, D and E (Dias *et al*., 2003) and a number of B vitamins. The lipids in crabs constitute a major source of highly unsaturated fatty acids (IOM, 2006). A number of studies have linked the health benefits of crab meat to its high content of omega-3 fatty acids, which the crab obtains from phytoplanktons and algae in its natural habitat. Research has shown that omega-3 fatty acids help in the prevention and control of many non-communicable diseases including obesity, diabetes mellitus, cancer, arthritis, hypertension and heart disease (Defilippis *et al*., 2010; Wilk *et al*., 2012).

According to Chindah *et al.,* (2000), crab harvesting was under exploited, and is done in other countries like Japan, China and other coastal areas using equipment like basket trap, bamboo cage, lift net, scissors net, fish corrals, gill net, wire trap and majorly circular lift net. Lynsey *et al*. (2009) reported that crab harvesting is a sustainable industry that enables crab survival and regeneration and as such ensures continuity in business.

Many crab species are consumed in various parts of the world including Nigeria. Many studies on the nutrient composition of crabs have been carried out with little or no research on the harvesting, and consumption rate of crabs in Nigeria.

There exist little or no information/literature on crab harvesting and consumption in Southern Cross River State where majority of the sea foods are harvested. Crabs are not readily available to people around land locked areas, but available in high quantities in coastal areas. Both crab meat and shell (bony tissue) are food that gives good healthy living considering their cheap status along coastal areas. This will not only improve the nutritional and health status of people living in the coastal communities but would also provide gainful employment during the off season slake periods while diversifying the aquaculture base of the state. This study is therefore designed to assess the consumption and harvesting of crabs in Southern Cross River State.

MATERIALS AND METHODS

The study was carried out in Southern Cross River State which comprises of seven Local Government Areas; Biase, Akampka, Odukpani, Calabar Municipal, Calabar south, Akpabuyo and Bakassi (Benjamin, 1982). Akpabuyo and Bakassi Local Government Areas were purposively selected for the study because the two areas are well known for sea food production.

Akpabuyo lies between latitude 4^0 28^I and 5^0 05^I N and longitude 8^0 20^I and 8^0 43^I E in Southern Cross River State, Nigeria. Akpabuyo is bounded to the East by the Republic of Cameroun and in the North by Bakassi Local Government Area. The area is located within a zone of convectional rainfall. It has a relative humidity range of 80 to 90% and a dry season temperature with maximum value of 29^0C and minimum value of 24^0C. The rainfall distribution in this area is characterized by a double maxima rainfall which starts from the month of March to October, reaching its climax in the month of July and September. It has an annual precipitation of 3,188mm (National Population Commission, 2015) and evapo-transpiration of 1,0877mm.

Akpabuyo has a population of 352,900, and an annual exponential growth rate of 3.18% (National Population Commission, 2015). The people are predominantly farmers and fishermen, and are major producers of cassava, cocoyam, kola nut, coconut, palm product and fruits as well as sea food (crab, shrimp, lobsters, prawn and crayfish).

Bakassi lies between latitude 4^0 43^I and 4^0 55^I N and $8^0 26^I$ E. It is bounded to the East by the Republic of Cameroon, in the south by Equatorial Guinea and the Bight of Bonny, in the west by Cross River Estuary and North by Akpabuyo Local Government Area. The entire area of Bakassi is underlain by one geological formation which is sedimentary basin also bounded by volcanic intrusion of the Cameroon. Bakassi has large deposits of crude oil and very rich in aquatic food such as crayfish, fishes, shrimps, crabs and periwinkles in commercial and exportable quantities. The composition of the people is predominantly the Efiks and Effiats, whose major occupation is fishing and Trans-Atlantic trading.

Fig 1: Map of Cross River State showing the study area
Source: Cross River State Forestry Commission, 2003

Sampling Technique and data collection

Two Local Government Areas (Akpabuyo and Bakassi) were purposively selected for the study. The selection was based on the fishing antecedents of the local people. Three fishing ports were also purposively selected from each of the two Local Government Areas. The fishing ports for Akpabuyo were Esuk-Mba, Offiong-Umoh and Esuk-Idebe while Akwa-Obutong, Ikang and Idua-Inwang were selected for Bakassi.

A total of ninety (90) copies of questionnaire were purposively administered to ninety fisher folks (fifteen per fishing port) who are often engaged in crab harvesting in the area of study. Also personal interviews and discussions were used to augment data collected from questionnaire. Data was collected on demographic features of respondents such as age, sex, level of education, marital status and harvesting experience. Harvesting methods of each respondent, constraints of harvesting and consumption, the species of crab harvested and the consumption outlet was documented.

Data Analysis

Descriptive statistics in form of frequency counts, simple averages, percentages, bar graph, pie chart, Likert Scale were used to present data obtained from the survey.

RESULTS

Respondent's demographic characteristics:

Crab harvesting is gender specific as only males (100.00%) were involved in the bsiness. Women are involved in other enterprises such as petty trading and preparation of crabs harvested by men (Table 1).

Table 1: Demographic characteristics of respondents in the study area

Variables	Frequency	Percentages (%)
Gender		
Male	90	100.00
Female	0	0.00
Total	90	100.00
Age		
21-30	29	32.22
31-40	39	43.33
41-50	20	22.22
51-60	2	2.22
>61	0	0.00
Total	90	100.00
Marital status		
Single	23	25.56
Married	65	72.22
Divorced	2	2.22
Widower	0	0.00
Widow	0	0.00
Total	90	100.00
Household size		
1-3	17	18.89
4-6	54	60.00
7-9	18	20.00
10-12	1	1.11
>12	0	0.00
Total	90	100.00
Educational level		
Never attended school	45	50.00
Primary education	33	36.67
Secondary education	12	13.33
Tertiary education	0	0.00
Total	90	100.00
Religion		
Christianity	80	88.89
Islam	0	0.00
Traditional	10	11.11
Total	90	100.00
Crab harvesting experience (years)		
0-10	38	42.22
11-20	40	44.44
>20	12	13.33
Total	90	100.00

Source: Field survey (2017)

Crab species abundance: Common crabs and their percentage responses are the brown (*Cancer pagurus*) (46.67%), black (Scylla serrate) (31.11%), blue (*Callinectis amnicola*) (13.33%) and milky (*Patamon fluviatile*) (8.89%) crabs (Fig. 2).

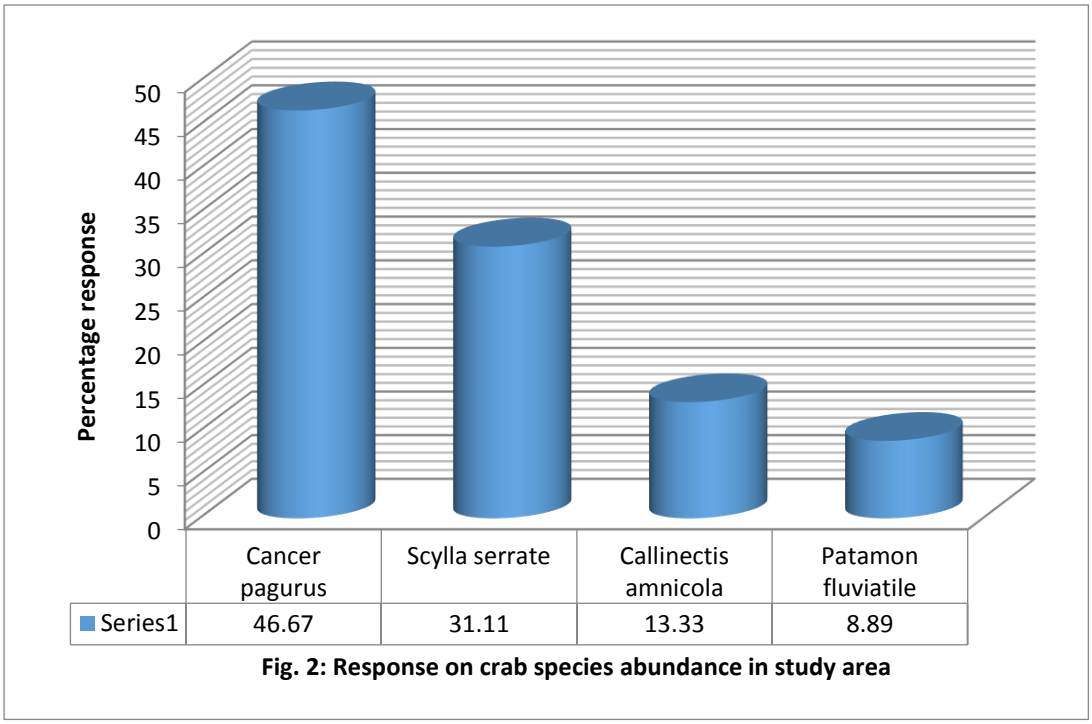
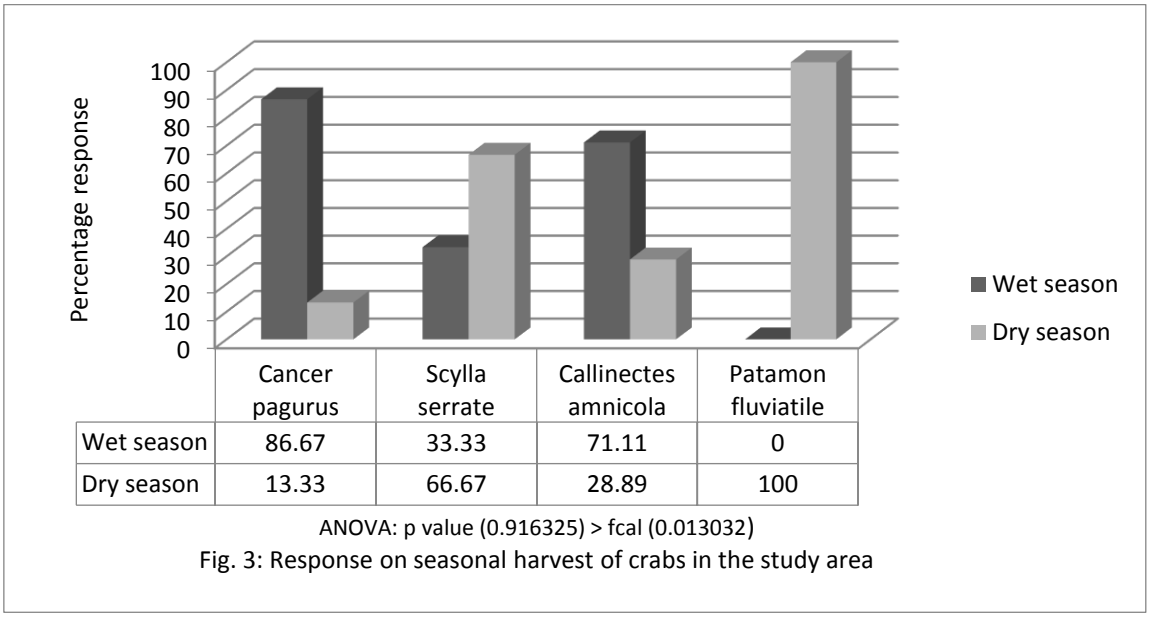


Fig. 2: Response on crab species abundance in study area

Source: Field survey (2017)

Seasonality of crabs

Though there in no significant difference ($p>0.05$) between seasons as indicated by response from questionnaire, the most suitable period for crab harvesting activity is the dry season (from January to April), as more species are caught during the dry season than in rainy season (Fig. 3).



ANOVA: p value (0.916325) > fcal (0.013032)

Fig. 3: Response on seasonal harvest of crabs in the study area

Source: Field survey (2017)

Equipment for harvesting crab

Crab harvesting is carried out with different equipment that are suited to the different seasons of harvesting. The equipment used in harvesting also determines the quality and quantity of crab harvested. Because of their inclination to high harvest and simplicity of usage, nets (47%) and baskets (39%) are the mostly used equipment to harvest crabs in the study area (Fig. 4). Other harvesting equipment not often used includes bamboo cages (9%) and crab pots (5%).

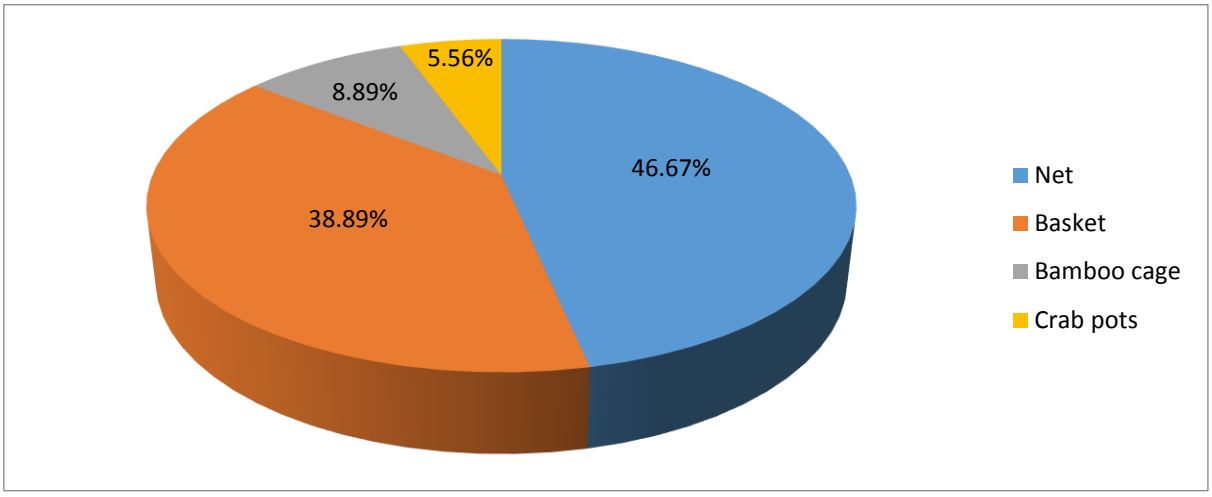


Figure 4: Harvesting equipment for crabs in the study area
Field survey (2017)

Consumption outlets of crab

Crabs are mostly sold and consumed within Cross River State (45.00%), some are sold to other neighboring states (31.00%) like Akwa-Ibom, Abia and Benue while others are exported to Cameroon and other West Africa countries (24.00%) Fig. 5.

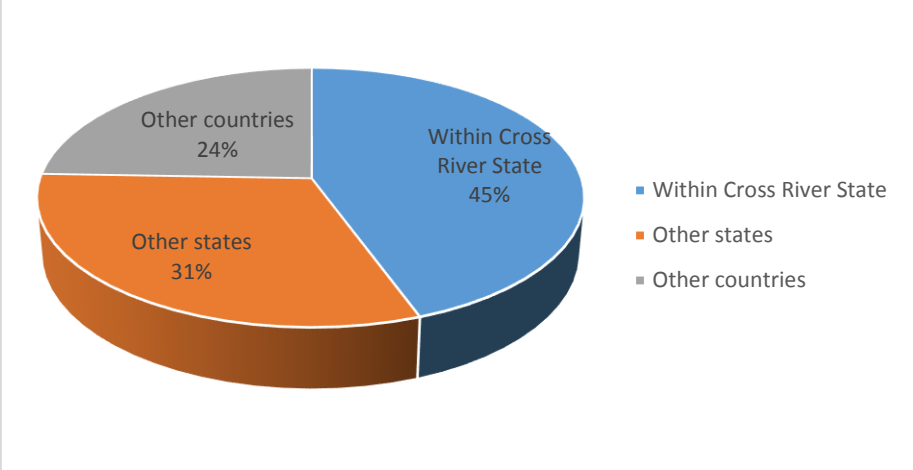


Figure 5: Crabs consumption outlets in the study area.
Source: Field Survey (2017)

Crab harvesting constraints

The constraints of crab harvesting and consumption at the study sites as represented in the Likert Scale in table 2 include lack of storage facilities (3.7), high rate of illiteracy amongst harvesters (3.6), lack of modern harvesting equipment (3.1), seasonality (3.3), unavailability of other alternative sources of livelihood (2.8) as well as difficulty in harvesting (2.6).

Table 2: Constraints to crab harvesting and consumption in the study area

S/No.	Constraints	SA	A	D	SD	Mean	Remark
1	Lack of storage facilities	70	15	2	3	3.7	Agree
		77.8%	16.7%	2.2%	3.3%		
2	Lack of modern harvesting equipment	12	72	5	1	3.1	Agree
		13.3%	80%	5.6%	1.1%		
3	Crabs are inadequate for business	11	7	61	11	2.2	Disagree
		12.2%	7.8%	67.8%	12.2%		
4	Seasonality	43	30	17	0	3.3	Agree
		47.8%	33.3%	18.9%	0%		
5	Low demand for crabs	4	20	62	4	2.3	Disagree
		4.4%	22.2%	68.9%	4.4%		
6	Religion non-acceptance of crab meat	2	4	54	30	1.8	Disagree
		2.2%	4.4%	60%	33.3%		
7	Difficulty in harvesting	2	54	30	4	2.6	Agree
		2.2%	60%	33.3%	4.4%		
8	Inadequate information on crab benefits	4	29	49	8	2.2	Disagree
		4.4%	32.2%	54.4%	8.9%		
9	Illiteracy among crab harvesters	63	22	4	1	3.6	Agree
		70%	24.4%	4.4%	1.1%		
10	unavailability of other alternative sources of livelihood	12	47	28	3	2.8	Agree
		13.3%	52.2%	31.1%	3.3%		
11	Poverty	2	30	40	18	2.2	Disagree
		2.2%	33.3%	44.4%	20%		

SA= Strongly Agree, **A**= Agree, **D**= Disagree, **SD**=Strongly Disagree.
Agree, if mean ≥ 2.5, Disagree if mean < 2.5
Source: Field Survey (2017)

DISCUSSION

A report by Chindah *et al.* (2002) show that crab harvesting was done by teenagers and women in times past, but more men are now involved in crab harvesting. The activity is risky and energy demanding and as such young but energetic males are often involved in this activity, and contribute meaningfully to the economy. The age distribution of the respondents suggest that they are mature and able to understand the processes involved in crab harvesting with a wealth of experience due to the number of years they have been in the business. This agrees with the studies of Tee *et al*. (2014), Ekwugha and Onyema (2013) that agricultural and allied activities make use of energetic youths who make significant contributions to the nation's economy.

Most harvesters were married with household size of four to six individuals. The implication is that the occupation is a livelihood activity that supports many families and their dependants. The activity is associated with high level of illiteracy as most harvesters never attended school. Interviews with some individuals revealed that educated individuals of the area view crab harvesting as an occupation for the illiterates and less privileged. Most educated youths of the area are into white-collar jobs or are seeking for such in urban areas of the state.

Though most harvesters are Christians, interviews with respondents showed that religion is no way a barrier to crab harvesting and consumption. Some traders who are involved in the trade are Muslims from Northern Nigeria.

The experience an individual has in a given occupation is directly proportional to the quality and quantity of output in that occupation. Crab harvesting and number of years of experience vary according to respondents, with forty respondents representing having eleven to twenty years' experience in the activity.

Dry season is the best season for crab harvesting because during this time, cracks and crevices occupied by water become dry and as such harvesters can invade such areas with ease. *Scylla serrate* and *Patamon fluviatile* are often harvested during the dry season while *Cancer pagurus*, *Callinectes amnicola* are harvested during the wet season. This agrees with the study of Neal and

Wilson (2005) that reported that brown crabs are abundant in the Atlantic and mostly consumed due to its abundance during the rainy season.

According to Omotayo *et al*. (2013), blue crabs are the most common species of crab found in the world, but brown crabs were the most common in the study area, with very few of blue crabs found in the dry season. Nets and baskets used for the harvest captures both juvenile and adult crabs as revealed by the study, and as making these methods unsustainable for harvesting crabs.

CONCLUSION

Crab harvesting is a veritable coastal enterprise that is capable of providing sustainable livelihood to those involved in it, and as such can provide income for rural households in the area of study as more than fifty percent of the harvest is sold outside the state. The activity is gender sensitive as only men are involved in the harvesting activity.

Crab harvesting as a livelihood activity in the area is an indication that attention should urgently be given to all the processes and concerns raised. Crabs are not sustainably harvested in the area, a situation which is a conservation threat, therefore, the need to address all the challenges associated with this business.

Recommendations

1. The government should encourage the harvesters and consumers by providing modern harvesting, processing and storage facilities for the harvested products
2. Effort should be made by extension agents to enlighten the general public on the health benefit and the nutrients components of crabs. This will encourage more patronage from individuals within and outside the study area.
3. Also public education and mass sensitization on sustainable harvesting of crabs is necessary in the area of study.
4. Government should provide good means of transportation (good roads) since majority of these fishing ports are located in the interior parts of the villages. This will further increase the internally generated revenue of the local government councils as more individuals pay tax to government.

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