Continental J. Applied Sciences 11 (1): 11 - 26, 2016
© Wilolud Journals, 2016
Printed in Nigeria

ISSN: 1597 – 9928
http://www.wiloludjournal.com
doi:10.5707/cjapplsci.2016.11.1.11.26

RESEARCH ARTICLE

FOODS OF THE BRACKISH RIVER PRAWN, *Macrobrachium macrobrachion* (HERKLOTS, 1851) FROM EKOLE CREEK, BAYELSA STATE, NIGERIA

Deekae, Suanu Nanee[1], Ansa, Ebinimi J.[2], Davidson, Edubamo Binaebi[1]
[1]Department of Fisheries and Aquatic Environment, Rivers State University of Science and Technology, P.M.B 5080, Port Harcourt, Rivers State, Nigeria

[2]African Regional Aquaculture Centre (ARAC) of The Nigeria Institute For Oceanography and Marine Research (NIOMR), P.M.B. 5122, Port Harcourt, Rivers State, Nigeria

ABSTRACT

The food and feeding of the brackish river prawn *Macrobrachium macrobrachion* from Ekole creek, Bayelsa State, Nigeria was studied from June to August 2013. Samples of the shrimp were collected fortnightly from Swali community (Station 1) and Agbura community (Station 2) at Ekole creek using a non-return valve trap locally called *orkow*. The sizes of specimen ranged from 3.40 cm to 10.5 cm and weighed between 0.5 g and 18.3 g with males generally larger than the females. The male ranged in size from 3.40 cm to 10.50 cm and weighed between 6 g and 18.30 g while the females ranged from 3.50 cm to 9.10 cm and weighed between 0.5 g and 10.10 g. The gut of each shrimp was dissected and examined under a high precision microscope (Model BM-100 Series XSZ-701/XSZ-107). The food items were identified with standard keys. The diet from the gut was analyzed using the frequency of occurrence and the point's methods. It was found that the prawn had an omnivorous diet feeding on a wide variety of organisms such as phytoplankton, plants, insect parts and larvae, zooplankton and unidentifiable items. The relative importance index (RI) showed that the diet is influenced by availability as most of the species prefer phytoplankton and plant parts while a few had zooplankton and insect parts. The shrimp can be said to be omnivorous. The prawns analyzed were classified as juveniles, young adults and adults with the young adults constituting majority of its population. The males were more in number than the females. The values obtained from the length/weight relationship (LWR) of *M. macrobrachion* showed a positive, significant correlation between total length and weight (r = 0.94). The condition factor, K of the shrimp provides information on the physiological state of the shrimp in relation to its welfare. The condition factor, K was between 1.274 and 1.513 for both male and female specimens; while 'K' values for male was 1.507 and female, 1.293. This showed that the species is in good condition in Ekole Creek, Bayelsa State, Nigeria.

KEYWORDS: shrimp, *macrobrachion*, food, water, creek

Received for Publication: 14/02/16 Accepted for Publication: 20/05/16
Corresponding Author: drsuanudeekae@gmail.com

INTRODUCTION

Shrimps constitute an important source of animal protein especially for coastal and rural dwellers of Nigeria and other parts of the world. There are many species of shrimps which are found in various water bodies in Nigeria such as *Macrobrachium macrobrachion, M. dux, M. felicinum, Farfantepena eusnotialis, F. penaeus. monodon, Atyagabonensis, Palaemonmaculatus, Nematopalaemon hastatus and Palaemonetes africanus.* The major families are *Penaeidae, Atyidae, Alphaeidae, Hippolytidae*, and *Palaemonidae*. The family *Penaeidae* and *Palaemonidae* have suitable species for aquaculture (Powell, 1983). Prawns inhabit ponds, freshwater, brackish water and marine habitats. Shrimps are valued as food and are made into various delicacies according to the various ethnic groups in the country. The exoskeleton of prawns could also be incorporated as an ingredient in livestock and fish feeds (Abowel *et al*., 2006).

The fishermen in the Niger Delta capture these shrimps from rivers and shallow waters during low tide using appropriate gears such as baskets, traps, hand and push-nets, and leaf-traps which are constructed locally (Marioghae, 1982). Palaemon prawns are crawling prawns although in their larval stage they are found suspended in the water column feeding aggressively on zooplankton. This behaviour changes when they metamorphose from being suspended in the water column to principally bottom dwelling and crawling individuals. Their feeding habit also changes at this stage.

This study was conducted to determine the feeding habits of *Macrobrachium macrobrahion*, the brackish river prawn from Ekole Creek. It thrives only in tidal fresh water and brackish water of low salinity, a little above 10 ppt and prefers a muddy environment (Powell, 1983). *Macrobrachium macrobrachion* is a decapod crustacean and according to Williams (1981) decapods are opportunistic omnivores, taking their food from the bottom of their habitats or from the fauna associated with submerged and shore vegetation in the water bodies. Marioghae (1987) stated that *M. macrobrachium* feeds on detritus, algae and diatoms; while Ansa *et al*., 2010 reported that the prawn was an omnivore and feeds on a wide variety of items including plants, plankton, detritus, and insect parts, but tended towards an herbivorous diet.

The cultivability of Nigerian Palaemonid prawns is considered with regards to whether they have a good adult size, a fast growth rate, ability to breed in captivity, a good adaptation to common environmental factors such as dissolved oxygen, salinity, etc. (Marioghae, 1987). However much is yet to be done to determine the food habits and feed requirements of prawns; an important component of aquaculture.

Food is simply referred to as any ingested material that can be digested, assimilated and utilized for energy production (Ugwumba and Ugwumba 2007). Each group of living organism has its range of materials which can be effectively utilized as food as long as it can furnish the organism with the basic nutrients required for growth, repair of tissues and provide source of energy for reproduction.

The food and feeding habit of organisms deals with the investigation of the dietary composition, their quantity and selectivity of the food materials (Hyslop, 1980). The knowledge of the natural diet of animal species is generally essential for the studies of their nutritional requirement, interaction with other organisms and their potential for culture.

Several studies of food and feeding habits have emphasized more on the qualitative rather than quantitative aspects. Majority of quantitative studies on food consumed are time consuming and are therefore the work of specialists (FAO, 1972, Ugwumba and Ugwumba, 2007 and Njifonjou *et al*., 2009). Hence, the more common information has always been what the fish has eaten and approximately in what proportions rather than show how much each species has eaten. Many species take in microscopic food and after being digested are reduced to fragments and are so mixed up that identification of individual food types and quantity becomes very difficult. So far, the foregut is the only means of observing the natural diet in many aquatic organisms because the food type they consumed are very difficult to identify from field observation (Kalu, 1997).

M. macrobrachion is one of the prawns in Ekole creek usually caught at low tide with suitable gears. This shrimp is important in terms of landings to the local people since it is used as food. It also constitutes a major source of protein in the diet of the people in the Niger Delta and other coastal States (Enin, 1994).

Very little work has been done on the food and feeding habits of *M. macrobachion.* The only record of the food and feeding habits of *M. macrobachion* is in the Nun River at Tombia, in Bayelsa State (Ansa *et al*., 2010). There is no major work on food and feeding habits of *M. macrobachion* in the Ekole Creek. It has its source from the River Nun which is a large drainage system in the Niger Delta.

It is an important water body due to the increasing level of fishing, waste disposal and transportation. These activities have affected the wild stock as seen in the catch of fishermen. The need to understand the food and feeding habits of this important shrimp species considered as candidate for aquaculture is of utmost importance which may lead to the successful culture of this species in massive scale thereby meeting the food needs of the populace. The objectives of this study are to determine the food organisms consumed and the proportion of food items in the gut of the species.

MATERIALS AND METHODS

The study was carried out at the Ekole Creek, in Yenagoa, Bayelsa State Niger Delta, and Nigeria. Two sampling stations (Swali and Agbura) were chosen along the creek for the purpose of obtaining the shrimp. The creek is a tributary of the Nun River in Bayelsa state Nigeria and located within Longitude 40 54'E and 01° 96"E and Latitude 6° 17'N and 55° 37'N in the Eastern part of the Niger Delta (Fig. 1.).

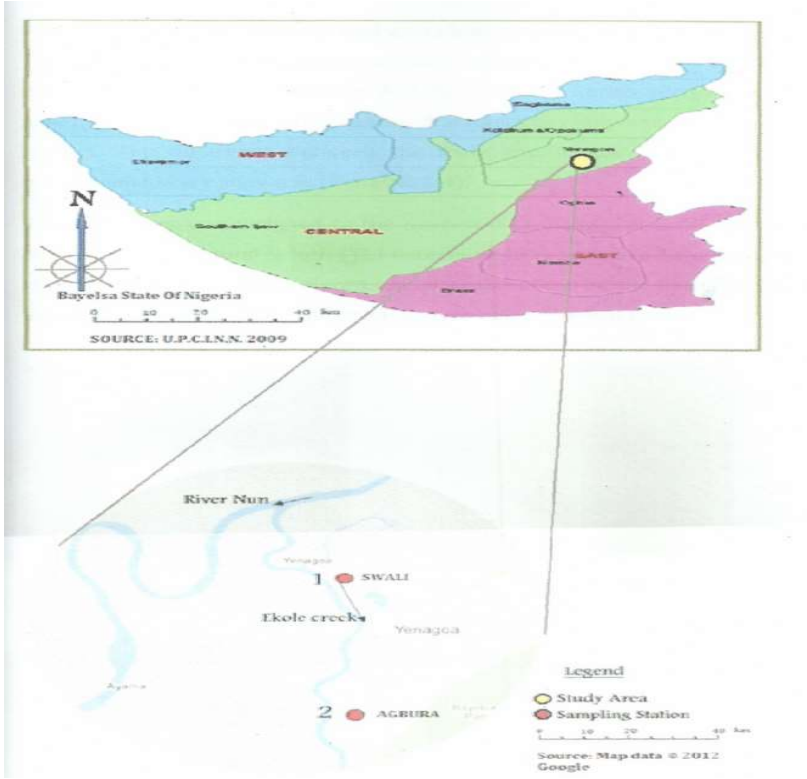

Fig. 1: Map of Niger Delta showing Yenagoa, River Nun, Ekole Creek and the Study Area

The climate is typically tropical with average all year temperature in the range of 25°C-30°C (Oporoma, 2011).

The ecological environment of Ekole creek is similar to most of the drainage systems of the Niger Delta region in Nigeria. The communities situated along this water way live in swampy environment with seasonal creeks full of water weeds and hyacinths. It has a characteristic loamy soil with large rain forest vegetation with turbid waters (Oporoma, 2011).

As a typical rain forest region the landscape is blessed with economic trees, herbal grasses and shrubs. Some economic trees are palm trees, mangoes, iroko trees, mahogany, coconut and raffia. These economic trees are useful for making palm wine, local gin, raffia, palm oil, soap making and canoe carving.

Other economic plants include plantain, cocoyam, sweet potatoes, yams cassava, pepper, okra, vegetables, banana, garden eggs, sweet potatoes and sugar cane. (Oporoma, 2011).

The forest and bushes are a safe heaven for all kinds of wildlife. Animals of all kinds are available for human consumption. There are two principal season, being the rainy and dry seasons. The

characteristic dry winds of the harmattan season are experienced between December and February every year.

Samples of various sizes were collected from fishermen twice in a month for a period of three months. Non-return valve trap locally called "Orkow" was used by the artisanal fishers to catch the prawns from Swali community (Station 1) and Agbura community (Station 2) along Ekole creek. Catches were sorted into various species especially *M. macrobrachion* and *M. vollenhovenii* but the *M. macrobrachion* was preserved in 5% formaldehyde solution prior to examination in the laboratory to arrest further digestion of food item (Hill, 1979).

The specimens were examined visually and with the aid of the binocular microscope Model BM-100 Series XSZ-701/XSZ-107 Series microscope for the juveniles to determine distinguishing characteristics between male and female species.

Each specimen was weighed to the nearest 0.1 g using GG Electronic scale Model J J2000 and total length (TL) determined to the nearest 1mm using a meter rule. The specimens were placed one after the other on the measuring pan of the electronic scale after adjustment at zero make to avoid error. A total of 1000 stomachs of *M. macrobrachium* were examined, out of which 104 had empty gut. Each gut content was exposed using dissecting needle. The gut was then slit open using blade and the entire contents placed on a slide to which a drop of water is added. The slide was viewed under the binocular microscope (4-40x) magnification. Organisms were identified with appropriate field guides and taxonomic keys (Jeje and Fernando, 1988; Enyi, 2004; Hilary and Erica, 1979; Allison, 2004). The frequency of occurrence and point methods (Hyslop, 1980; Ugwumba and Ugwumba, 2007) were used for analyzing the food items. Each method of food analysis emphasized the importance of different categories of food items. The Index of relative importance (IR) of each food item is based on the Absolute importance index (Al). This is because Absolute importance index takes into consideration the method of analysis that reflects numbers, occurrence and bulk of food. Index relative importance (IR) was calculated using the formula below:

$$RI = \frac{100AI}{\sum_{i}^{n} AI} \quad \text{(Ugwumba and Ugwumba, 2007)}$$

Al = Absolute importance index (i.e. % occurrence + % point) of food item
Al = % F + % P
%F = the percentage frequency of occurrence of a food item.
%P = the percentage point of the food item.

$$\sum_{i}^{n} \mathrm{AI} = \frac{\mathrm{AI}_1 + \mathrm{AI}_2}{\Sigma \mathrm{N}} \ \ldots \ \mathrm{Aln}$$

N = number of the different food items.
The Fulton's condition factor 'K' determines the general well-being of the species and the condition factor 'K' for *M. macrobrachium* was calculated using the equation below:

$$\mathrm{K} = \frac{100\mathrm{w}}{\mathrm{L}^3} \text{ (Gayanilo and Pauly, 1997)}$$

Where: L = Length in centimetres (cm); Weight in grams (g); K = Condition factor.

Data obtained were subjected to statistical analysis using SPSS Statistics (2014) and SAS (2003). These packages analyzed regression, pearsons correlation and descriptive statistics.

RESULTS

Food Analysis

Table 1 shows the variety of food items found in the stomach of *M. macrobrachium* with plankton being the major food item. The plankton found in the stomach of *M. macrobrachium* included Chlorophyta (Green Algae), Xantophyta, Cladocera, Copepoda, Euglenophyta and Diatoms (brown algae).

Insect parts, unidentified organisms and sand grains were also encountered. Using the frequency of occurrence method the Chlorophyta are the most consumed phytoplankton. They include; *Trentephohlia* (7.94%), *Oedogenium* (7.89%) and *Cloniophora*(7.64%). The most consumed Cyanophyta is the *Microcoleus* (7.44%) and diatom *Achnanthes*(6.23%) while insect larvae and shrimp eggs were the least consumed food items. The calculation of the importance and bulk of each food using Absolute Importance Index and Relative Importance Index is given on (Table 2).

Table 1 Analysis of the stomach contents of *Macrobrachium macrobrachion* indicating the frequency of occurrence and points methods from Ekole Creek, Bayelsa State, Nigeria

Food item	Food item	No of stomachs	Frequency of occurrence method (%)	'point' awarded	Point method (%)
Xanthophyta	*Tribonema*	7	0.079	3	0.43
Diatom	*Melosira*	389	4.38	60	8.51
	Nitzechia	14	0.16	5	0.71
	Achnanthes	553	6.23	10	1.42
	Gomphonema	63	0.71	6	0.85
	Synedra	57	0.64	5	0.71
	Pinnularia	48	0.54	4	0.57
	Epithemia	66	0.74	3	0.43
Chlorophyta	*Ulothrix*	494	5.56	9	1.28
	Oedogenium	701	7.89	35	4.97
	Stigeoclonium	514	5.79	25	3.55
	Cloniophora	679	7.64	30	4.26
	Pteromonas	28	0.32	5	0.71
	Mougeotia	615	6.92	3	0.43
	Prasiola	41	0.46	7	0.99
	Rhizoclonium	32	0.36	10	1.42
	Trentepohlia	705	7.94	15	2.13
Cyanophyta	*Aphanizomenon*	9	0.10	8	1.13
	Miicrocoleus	661	7.444	5	0.71
	Tolypothrix	3	0.03	5	0.71
	Nostoc	15	0.17	2	0.28
	Anabaena	56	0.63	16	2.27
Euglenophyta	*Euglena*	361	4.06	30	4.26
Plant	*Plant leave*	236	2.66	20	2.84
	Plant parts	403	4.54	65	9.22
Insects	*Chironomid Larva*	16	0.18	7	0.99
	Mosquito pupa	87	0.98	30	4.26

	Va's of insects	129	1.45	45	6.38
Crustaceans	*Shrimp egg*	11	0.12	6	0.85
	Pof crustaceans	318	3.58	50	7.09
	Crab appendage	5	0.06	5	0.71
Copepods	*Harpacticoid Bryocamptus*	23	0.26	4	0.57
Cladocera	*Parts of antennas*	96	1.08	55	7.80
	Body parts	114	1.28	45	6.38
Others	*Sand grains*	605	6.81	20	2.84
	Oil droplet	47	0.53	6	0.85
	Unidentifiable Objects	676	7.61	40	5.67
	Total	**8883.00**	**99.99**	**705**	**100.03**

Table 2: Absolute importance index of relative importance of *Macrobrachium macrobrahion* from Ekole Creek, Bayelsa State, Nigeria

Food item	Frequency of occurrence method (%)	Point method (%)	Absolute importance index (Al)	Index of relative importance (Rl)
Tribonema	0.079	0.43	0.51	9.69
Melosira	4.38	8.51	12.89	244.87
Nitzechia	0.16	0.710.87 16.53		
Achnanthes	6.23	1.43	7.65	145.33
Gomphonema	0.71	0.85	1.56	29.64
Synedre	0.64	0.71	1.35	25.65
Pinnularia	0.54	0.57	1.11	21.09
Epithemia	0.74	0.43	1.17	22.23
Ulothrix	5.56	1.28	6.84	129.94
Oedogenium	7.89	4.97	12.86	244.30
Stigeoclonium	5.79	3.55	9.34	177.43
Cloniophora	7.64	4.26	11.90	226.07

Pteromonas	0.32	0.71	1.03	19.57
Mougeotia	6.92	0.43	7.35	139.63
Prasiola	0.46	0.99	1.45	27.55
Rhizoclonium	0.36	1.42	1.78	33.82
Aphanochaete	0.07	0.85	0.92	17.48
Trentephohlia	7.94	2.13	10.07	191.30
Aphanizomenon	0.10	1.13	1.23	23.37
Microcoleus	7.44	0.71	8.15	154.83
Tolypothrix	0.03	0.71	0.74	14.06
Nostoc	0.17	0.28	0.45	8.55
Anabaena	0.63	2.27	2.90	55.09
Englena	4.06	4.26	8.32	158.06
Plant leave	2.66	2.84	5.50	104.48
Plant parts	4.54	9.22	13.76	261.40
Chironomid larva	0.18	0.99	1.17	22.23
Mosquito pupa	0.98	4.26	5.24	99.55
Larva's of insect	1.45	6.38	7.83	148.75
Shrimp egg	0.12	0.85	0.97	18.43
Parts of crustaceans	3.58	7.09	10.67	202.70
Crab appendages	0.06	0.71	0.77	14.63
Harpacticoid, Bryocamptus	0.26	0.57	0.83	15.77
Parts of antennas	1.08	7.80	8.88	168.69
Body parts	1.28	6.38	7.66	145.52
Sand grains	6.81	2.84	9.65	183.32
Oil droplet	0.53	0.85	1.38	26.22
Unidentifiable objects	7.61	5.67	13.28	252.28

Size class distribution and length-weight relationship of *Macrobrachium macrobrachion.*

The specimens analyzed ranged from 3.40 cm to 10.5 cm and weighed between 0.5 g and 18.3 g with males generally larger than the females. The males ranged in size from 3.40 cm to 10.50 cm and weighed between 6 g and 18.30 g while the females range from 3.50 cm to 9.10 cm and weighed from 0.5 g and 10.10 g (Table 3).

The prawn juveniles ranged in size from 3.5c m to 3.9 cm and weighed between 0.5 g and 1.0 g. The young adults range in size from 4.0 cm to 7.9 cm and weighed between 1.l g and 5.7 g. The adults ranged in size from 8.0 cm to 10.5 cm and weighed between 5.8 g and 18.3 g with the young adult constituting majority of the prawns analyzed from the two stations for the period of sampling (Table 4).

Length-weight measurements of *Macrobrachium macrobrachion* from Ekole Creek for the period of collection is given in (Table 5) indicating measurements of the different sexes of the species from Ekole Creek.

Parameters of length-weight relationship of *Macrobrachium macrobrachion* observed in the area is shown in (Table 5). The correlation coefficient (r) for the different months is given; June (r=0.915), July (r=0.919) and August (r=0.941). The value for species is (0.930).

The growth parameter 'a' and 'b' of the length-weight relationship observed in the area for the different months and sex is given in (Table 6). The 'b' value for the species is (1.941).

The values suggest negative allometric growth. The condition factor 'K' obtained during the period of collection was K = 1.484 (Table 6). The condition factor for the male (K= 1.507) was higher than that of the female (K=1.293) in (Table 6). The prawns were therefore in good condition.

Table 3: Size class of *Macrobrachium macrobrachion* from Ekole Creek, Bayelsa State, Nigeria

Length class interval (cm)	Group	Female	Male	Total
1.0-3.9	Juveniles	11	8	19
4.0-7.9	Young adult	443	391	824
8.0-11.9	Adult	2	145	147
Total		456	544	1000

Table 4: Monthly collection of *Macrobrachium macrobrachion* from Ekole Creek, Bayelsa State, Nigeria

Length class age interval (cm)	Age	June	July	August
1.0-3.9	Juveniles	7	7	5
4.0-7.9	Young adult	392	255	187
8.0-11.9	Adult		51	96
Total		339	313	288

Table 5: Length-weight measurements of the sexes of *Macrobrachium macrobrachion* from Ekole Creek, Yenagoa, Bayelsa, Nigeria

Species/sex	No	Measurement	Mean
Female	456	Length (cm)	5.62+0.04
		Weight (g)	2.30+0.05
Male	544	Length (cm)	6.92+0.07
		Weight (g)	4.99+0.15
	1000	Total length (cm)	6.33+0.05
		Total weight (g)	3.76+0.09

Table 6: Parameters of length-weight relationships of species landed in the different stations in Ekole Creek, Yenagoa, Bayelsa (June to August, 2012)

Month/sex	R	(r^2)	B	A	Condition factor (k)
June	0.915	0.837	1.089	-3.863	1.274
July	0.919	0.844	2.039	-9.202	1.451
August	0.941	0.885	2.090	-9.391	1.513
Female	0.910	0.828	1.163	-4.245	1.293
Male	0.934	0.872	2.111	-9609	1.507
Total	0.30	0.865	1.941	-8523	1.484

DISCUSSION

The knowledge of the diet of a species in nature is important for the establishment of its nutritional need and shows its interaction with other organisms (Albertoni *et al.,* 2003).

The analysis of the gut contents of *M. macrobrachium* revealed that, though the prawn feeds on a wide variety of food items, it showed preference for algae. This behavior has been reported in other prawns like *M. vollenhovenii* which was stated to feed on algae and microcrustaceans (Yakubu, 2002).

This is not uncommon in crustacean as they are omnivorous. Sagua (1980) reported that *Nematopalae monhastatus* feed on crustaceans, vegetable matter, polychaetes, mollusks and larval fish.

Similarly Marte (1980), Marioghae (1982, 1985) observed that penaeids like *Penaeus monodon* and *P. notialis* showed a carnivorous disposition in addition to algae. Plant materials occurred more frequently in the gut of the species. Phytoplankton formed major part of the food item in *M. macrobrachium*. Ansa *et al.,* (2010) showed that *M. macrobrachion*. *M. vollenhoveniii* and *M. felicinum* are omnivorous species being able to feed on a wide variety of organisms.

This is also is agreement with the studies of Abayomi *et al*., (2011); Bello-Olusoji *et al*. (1995) on *M.vollenhovenii,* Mariana (2007) on *M. amazonicum* and Roy and Singh (1997) on *M.choprai* which suggested that prawns are omnivores. The occurrence of sand grains is not really because it is a preferred food item but because of the species opportunistic behavior as indicated by (Williams, 1981) of decapods species.

The largest male prawn measured 105 mm (TL) and the largest female was 101 mm (TL). This showed that Ekole Creek had small specimens when compared to Luubara Creek with adult size mostly 107 mm (Deekae and Abowei, 2010b) and Cross River 110 mm (Enin, 1995). In the New Calabar River Marioghae (1987), reported 138 mm while Rutherford (1971) gave 125 mm for Cape Coast in Ghana. Males were generally larger than females.

The correlation coefficient r= 0.94 obtained from the length-weight relationship of *M. macrobrachion* in Ekole Creek shows that there was a significantly positive correlation between total length and weight. This is similar to findings by Deekae and Abowei, 2010c who obtained a value of r =0.98 for prawns from Luubara Creek; while Enin (1994) for the Cross River estuary had value of r = 0.969.

These values showed that there is positive relationship between the length and weight of prawns as the length increases, the weight also increases. The growth parameter ‘b’ in the length-weight relationship (LWR) of *M.macrobrachion* at Ekole Creek has a value of 1.94. The value of b for this species is less than 3, showing that the growth was negative allometric. This result is different from that of Okayi*et al*. (2010) who reported the mean b values of *Palaeomonetes africanus* and *Demoscarisbislineata* as 2.19 and 1.79 respectively for Mu River, Makurdi, Benue State. Chu *et al*., (1995) obtained b values of 2.84 and 2.89 for the penaeid shrimps, *Metapene ausensis* and *Metapenaeus joyneri* from Zhujiang estuary China. This is contrary to isometric growth reported by Okayi and lorkyaa (2004) who obtained ‘b’ values of 2.989 and 3.003 respectively for *Atyagabonensis* and *Macrobrachium felicinum* in River Mu, Benue State, Nigeria. Deekae and Abowei, (2010c) reported b values of 3.13 for *M. macrobrachion* from Luubara Creek, Ogoni Land, Nigeria while Enin (1994) reported b value of 3.28 for *M. macrobrachion* for Cross River estuary.

Abowei (2000) disclosed that the b exponent indicates the rate of weight gain relative to growth in length and varies among different populations of the same species. Okayi and lorkyaa (2004) were of the opinion that isometric growth is as a result of availability of food and sufficient space to support the biomass.

The condition factor K of the prawn provides information on the physiological state of the prawn in relation to its welfare. The condition factor K was between 2.274 and 1.513 with a mean of 1.48 for the whole specimen obtained in this study.

This result is comparable to that of Deekae and Abowei, (2010b) who obtained K value of 1.98 for palaemonid prawns from Luubara Creek, and Enin (1995) reported K value of 1.79 for prawns in the Cross River estuary. The result of this study indicates that this species is in good condition in Ekole Creek.

From the result of the qualitative analysis of the stomach contents using the frequency of occurrence and point methods, it shows that *M. macrobrachion* in Ekole Creek is an omnivorous species as also observed by other authors.

This is particularly important for the culture of this organism. *M. macrobrachion* has been reported to possess high commercial aquaculture potential, but this is yet to be realized in Nigeria and with the knowledge of the feeding habits of *M. macrobrachion* from this study, it should be possible to formulate artificial diets necessary for the mass production of this prawn.

This will help to meet local demands and possibly generate foreign exchange for Nigerian prawn farmers. The availability of adult male and female prawns from Ekole Creek, Bayelsa State indicates the location is a ready source of brood-stock for those intending to embark on breeding and culture trials of the species.

REFERENCES

Abayomi, A.J, Edwin O.C, Olusegun O.W and HalernahB.A. (2011). Food and feeding habits of the African river prawn (*Macrobrachium vollenhovenii)*, Herklots, (1857) in Epe lagoon, southwest Nigeria. *Inter. Journ. of Fisheries and Aquaculture,* 3(1), 10-15.

Abowei, J.F.N. (2000). Aspects of Fisheries of Lower Nun River, Nigeria. Unpublished Ph.D Thesis, University of Port Harcourt, 248pp.

Abowei, J.F.N., Deekae, S.N., Allison, ME., Tawari, C.C. and Ngodigha, S.A. (2006). *A Review of Shrimp Fisheries in Nigeria*. Pre-Joe Publisher, a Division of Pre-Joe Ventures, Rumueme Housing Estate, Port Harcourt.

Albertoni, E.F. Palma-Silva, C and Esteves, I. (2005), Natural diet of three species of shrimps in a tropical coastal lagoon. *Brazilian Archioes of Biology and Technology,* 46(3), 395-403.

Allison, S (2004) *Stream macroalgae of Hawaii: An identification guide to the common genera*. Department of Land and Natural Resources Division of Aquatic Resources Honolulu, USA.

Ansa E.J., Hart, A.I., Davies, C.B. and Yakub, A.S. (2010). Food habits, sexual dimorphism and sex ratio of three palaemonid prawns of the Nun River, Niger Delta, Nigeria. *In*: Ansa, E.J.,

Fashina-Bombatta, H., Ndimele, P.E. (Eds). Proceedings of the 25th Annual Conference and Fair of the Fisheries Society of Nigeria, EKO 2010. 25th – 29th October, 2010. FSN-FB 0012 (Published).

Bello-Olusoji O.A., Balogun, A.M., Fagbenro A.O. and Ugbaja N. (1995) Food and feeding habits of the African river prawn *Macrobrachium vollenhovenii* (Herklots 1857). European Aquaculture Society, Special Publication, 24, 1-3.

Chu, K.H.; Chen, Q.C.; Huang, L.M. and Wong, C.K. (1995). Morphometric analysis of commercially important penaeid shrimps from Zhujiang estuary, China. *China Fisheries Research,* 23; 83-93.

Deekae, S.N. and Abowei, J.F.N. (2010b). The fecundity of *Macrobrachiurn macrobrachion* (Herklots 1851) from Luuubara Creek Ogoni Land, Niger Delta, Nigeria. *International Journal of Animal and Veterinary Advances,* 2(4), 148-154.

Deekae, S.N. and Abowei, J.F.N. (2010c). *Macrobrachiurn macrobrachion* (Herklots 1851) Length-Weight Relationship and Fulton's Condition Factor in Luubara creek, Ogoni Land, Niger Delta, Nigeria. *International Journal of Animal and Veterinary Advances* 2(4) 155-162.

Enin, U.I (1994). Length -weight parameters and condition factor of two West African Prawns. *Rev. Hydrobiol Trop.,* 27(2), 121-127.

Enin, U.I (1995). First estimates of growth, mortality and recruitment parameters of *Macrobrachium macrobrachion* Herklots, 1851 in the Cross River Estuary, Nigeria. Dana, 2(1), 29-38.

Enyi, O.J (2004). *A survey of the Algae*. Celwil Nigeria Limited, Daminabo Close, Abuloma Town, Port Harcourt. 127pp.

FAO (1972). *Food and feeding*. Available

from<http://www.fao.org/D0CREP/003/F0752E/F0752E06.htm.

Gayanilo, F.C and Pauly, D. (1997). FAO-ICLARM Stock Assessment Tools (FISAT). FAO Computerized Information Series (fisheries) No. 8, Rome, pp: 262.

Hillary, B and Erica, S. (1979). A beginner guide to freshwater algae: Institute of Terrestrial Ecology and Environmental Research; Centre of Algae and Protozoa Studies, Cambridge.

Hill, B.J. (1979). *Aspects of Feeding Strategy of the Predatory Crab Scylla Serrata*. Marine Biology. 55, 209-214.

Hyslop, E.J. (1980). Stomach contents analysis: a review of methods and their application. *J. Fish. Biol*, 17, 411-429.

Jeje, C.Y and Fernando, C.H (1988). *A practical guide to the identification of Nigerian zooplankton* (Cladocera, Copepoda and Rotifer. Published and Printed by Kainji Lake Research Institute. Kainji, Nigeria.

Kalu, A.I (1997). The food and feeding habits of the swimming crab. *Callinect esamnicola*. (Portunidae) of the New Calabar River. B.Sc Thesis. Rivers State University of Science and Technology. Port Harcourt. Nigeria. p 2.

Marioghae, I.E., (1985). Review of research on Penaeid shrimps in Nigeria. In (Wilcox, B.H.R and Powell, C.B (eds). The mangrove ecosystem of the Niger Delta; proceeding of a workshop. Publication committee. *University of Port Harcourt, Nigeria*. 212-225.

Marioghae, I.E., (1987). *An Appraisal of the cultivability of Nigerian Palaemonid* prawns: FAO/ARAC Working Paper/87/WP4.3-6.

Marioghae, I.E., (1982). Note on the biology and distribution of *Macrobrachium voiienhovenii* and *M. macrobrachion* in Lagos Lagoon (CrustaceaDecapoda, Palaemonidae) *Review de Zoologie. Africaine*, 96 (30), 493-508.

Marioghae, I.E. (1990). Studies on fishing methods, gear and marketing of *Macrobrachium* in the Lagos area. Nigerian Institute for Oceanography and Marine Research, Technical Paper, 100, 16pp.

Marte, C.L (1980). The food and feeding of *Penaeusmonodon* Fabracus collected from Makatoriver, Akian, Philipines (Pacapda, Natantia). *Crustacea*38(3), 225- 236.

Njifonjou, O.J. A, Christian S and Maxwell, D. (2009). *Ecosystem-Based Fisheries Management with Emphasis on Fish Diet- User's Guide.* Guinea Current Large Marine Ecosystem (GCLME) Project.

Okayi, R.G and Iorkyaa, A. (2004). Length-Weight Relationship and Condition of Freshwater Shrimps *Atyagabonensis* and *Macrobrachiumfelicinium*from the Mu River, Makurdi, Nigeria. *Animal Research International,* 1(3), 6-7.

Okayi, R.G, Ataguba, G and Nyishagha, O. (2010). Biology of two freshwater prawns (*Palaeomonetes africanus* and *Demoscaris bislineata*) from the MU River, Makurdi- Benue State, Nigeria; *Journal of Animal & Plant Sciences*, 5, (3), 544- 549.

Oporoma, C. (2011). Sustainable Livelihood Assessment Report [Sla Agbura). Collective Capacity for Peace Development Otiotio Road Yenizuegene, Yenegoa, Bayelsa State.

Availablefrom<http://oporomaclusterdf.org/pdf_stuff/SLA.

Powell, C.B. (1983). Fresh and brackish water shrimps of economic importance in the Niger Delta. In: Proceedings of the 2nd Annual Conference of the Fisheries Society of Nigeria (FISON). P 254-285.

Roy, D. and Singh, R.S (1997). Food and feeding habits of a freshwater prawn *Macrobrachiumchoprai.Asian Fisheries Society*, (10), 51-63.

Rutherford, A (1971). Freshwater shrimps in the area of Cape Coast, Ghana. *Ghana J. Sci*., 11(2), 87-91.

SAS (2003). Statistical analysis system. Users guide SAS/STA-t, version, 8th edition USA, SAS Institute, Inc, Cary, NC.

Sagua, V.O. (1980). Observations on the ecology and some aspects of reproductive biology of the small white shrimp *Palaemon hastatus*Aurivillius (Crustacea; Palaernonidae) in the Lagos area of Nigeria. Bull. Inst. Fundamental *Afr. Noir Series A*, 42(2), 279-295.

SPSS (2004). Statistical package for science and social sciences, version 13 for Windows. Apache software foundations and lead technologies, USA.

Ugwumba, A.A. A and Ugwumba, O.A (2007). *Food and feeding ecology of fishes in Nigeria.* Crystal Publishers Ajah, Lagos, 9lpp

Williams, M.J (1981). Methods for analysis of natural diet in Portunid crabs (crustacean; Decapoda and Portumdae). *Journal of Experimental Marine Biology and Ecology;* 52, 103-113.

Yakubu, A.F. (2002). Wet season availability of food and feeding habits of *M. vollenhovenii* (Herklot 1857). In New Calabar river, Nigeria. Master of Science (Aquaculture), Thesis, Rivers State University of Science and Technology, Port Harcourt.