Advances in Life Science and Technology
ISSN 2224-7181 (Paper) ISSN 2225-062X (Online)
Vol.46, 2016

The Biology of the Hairy Mangrove Crab Sesarma huzardii from Lagos Lagoon, Nigeria

OLUWAKAYODE-OLUYI, O. O
Nigerian Institute for Oceanography and Marine Research (N.I.O.M.R) P. M. B. 12729, 3-Wilmot Point Road, Victoria Island, Lagos, Nigeria

Abstract:
Some aspect of biology of the hairy mangrove crab *Sesarma huzardii* was studied. A total of five hundred and one (501) samples of *Sesarma huzardii* were collected from the mangrove swamp of Lagos lagoon front. Samples were examined for a period of six months (March, 2012 to August, 2012). The growth pattern, food and feeding habits, condition factor, sex ratio and reproduction biology of the crab were investigated. The summary of the length-weight relationship showed Log W= Log 0.6932 + 0.8787 Log L(n = 501, r = 0.4665) which reveals a negative allometric growth. Stomach content reveals *S. huzardii* to be an opportunistic omnivore as stomach content showed the presence of algae filament (34.8%), *Nitzschia lineris* (26.5%). *Navicula cuspidate* was the most abundant with 36.9%. The least abundant was *Oscillatoria limnosa* 1.6% by numerical method and by the frequency of occurrence, *Navicula cusipadate* also constituted the most abundant food items with 1.31%, *Nitzschia linearis* with 0.69%, algae filament was 0.93 and *Oscillatoria limnosa* was 0.22%. The sex ratio was 1:0.38 as the males were twice the number of females. Result for condition factor was 3.79 for both sexes and from the investigation they where three female that were ovigerous out of 501 samples analyzed. *Sersama huzardii* was more abundant from March to May and a decline in abundance from June to August. Generally, the analyses of *Sesarma huzardii* reported in this study are within normal limits.
Keywords: *Sesarma huzardii*, growth pattern, food and feeding habit.

Introduction

Crabs belong to the phylum Arthropod (jointed legs) which is the largest in the kingdom Animalia with over 42,000 extent species and made up of more than 75% of all living organisms (Canniccil *et al.,* 1995). Their diversity and abundance is due mainly to their high adaptability to varying condition in mangrove communities. They are one of the least exploited crustaceans in artisan and trawler fishers in West Africa. In this region, the target species is shell fishes and prawn and shrimps that have high export potential (Ajana, 1996; Awosika 2002). They have broad rather round, upper carapace and small abdomen tucked beneath the body and they live in marine, brackish and freshwater. They differ from species to species in shape color and structure. They closely resemble each other in general morphology and biology (Gillikin, 2004). Crabs are mostly marine, although there are some freshwater and brackish water forms occupying the littoral, supra littoral and even up shore zones. They were found at even 6000 m depths to seas shore and are dominant in many estuarine habitats where salinity and temperatures can fluctuate dramatically daily (Ng *et al.,* 2008). Many species actively forage on land and several species have become semi-terrestrial (Adamezewska *et al.,* 1997; Morris & Van Aardt, 1998; Cumberlidge, 1999). Tropical and subtropical regions have more number of crab species compared to temperate and cold regions (Fransozo and Negreiros- Fransozo, 1996; Boschi, 2000a). Crabs make up 20% of all marine crustaceans caught and farmed worldwide, with over 1½ million tonnes being consumed annually (Cumberlidge 1999).

The mangrove crabs (Sesarmidae) are the dominant species of crabs in the mangrove swamps. They live beneath drift and high-tide mark in the estuaries and lagoons (Cannicci *et. al.*, 1995). They are amphibious in habit and can be found around intertidal areas with moist/wet muddier regions of the mangrove (Gillikin, 2004). Thus, the aim of this study is to have additional information on the biology of the hairy mangrove crab from the mangrove area of Lagos Lagoon with particular reference to growth pattern, food and feeding habit ,condition factor and reproduction biology.

MATERIALS AND METHOD

The study site for *Sesarma huzardii* is the coast mangrove area of Lagos Lagoon front and is located at southwestern Nigeria. The Lagos Lagoon system is the largest of the four lagoon systems of the Gulf of Guinea (Chukwu, 2002). Is one of the nine lagoons in South-western Nigeria (Webb, 1958a; Nwankwo, 2004b; Onyema, 2008a).Owing to the dynamics of river inflow and seawater incursion, the Lagos lagoon experiences brackish condition that is more discernable in the dry season. In the wet season, the increased river inflow creates freshwater and low brackish conditions in various parts of the lagoon. The lagoon opening forms an extensive habour which serves as a major outlet of fresh water from the lagoon system during rainy season; it is opened throughout the year and exposed to semi-diurnal tides. The tide range is low less than 1.0 in the lagoon (Oyenekan, 1992).

Collection of specimen
Specimen of *Sesarma huzardii* was collected at the Lagos lagoon. They were caught with hand and collection was done randomly over a period of six month each on weekly basis between the months of March to August 2012.

Laboratory procedure
The crabs were removed from the freezer and allowed to thaw. Excess water was removed from the specimen using filter paper. The crabs were immediately preserved in an ice-chest with ice block and transferred into deep freezer (-20C) in the laboratory prior to the analysis. A total of 501crab were studied.

The carapace length of the crabs measures to the nearest centimeter from the edge of the frontal region to the tip of the carapace back wall using a simple vernier caliper. The carapace width and length were measured in centimeter, other measurements include the left and right cheliped , length of the abdomen(from the edged of the carapace to end of the ovary)length of thorax (from the posterior end of the first thorax to the base of the abdomen). Total weight of left and right chelipeds were measured to the nearest tenth of a gram using Sartorious Top Loading Balance (model 1106) the result were recorded in a profomer for each specimen before dissection. Each was dissected by removing the carapace and the carapace and the stomach content into a Petri-dish containing little water. The stomach content was later examined under microscope and the various food items identified and counted for individually. For the ovigerous crabs, the eggs mass was carefully removed from the pleoplod using tweeter. Then the eggs were weighed.

Growth biology
For the growth pattern, data for the carapace length-weight relationship and carapace width-weight relationship were complied. The carapace length-weight relationship was expressed by the equation
$W = aL^b$
Where W= weight of crab in gram
L= carapace length in centimeter
a= regression constant
b= regression co. efficient
The equation was transformed into a linear graph as
LogWt = Log a + b Log L…….. (Parson 1988)

The condition factor (K)
It is the condition of the general wellbeing of a crab. It was studied in relationship to size. Bannister (1976) gave the equation for condition factors as follows

$$K = \frac{100W}{L^3}$$ (Bannister 1976)

Where K =condition factor
W = weight of the crab (g)
L = length of the crab (cm)

Food analysis
The crabs were dissected and the stomach removed for analysis. Each stomach was studies as a unit in order to provide information on individual variation. The stomach is located underneath the carapace and it is divided into four parts.

Numerical method
Food items in the number of individual of each were counted. They were added to give totals for each kind of item in the whole sample. The grand total were obtained for all food items and expressed as a percentage of the total number of food found in all crabs examined.

Frequency of occurrence method
Stomach content was examined and the individual food organisms sorted and identified. The number of stomach in which each occurs was recorded and expressed as a percentage of the total number of stomach with food. The method gives information only on the organisms fed on. Its disadvantage is that it does give information on quantities or numbers and it also takes into consideration the accumulation of food resistant to digestion, (Barnes,2001).

Statistical analysis
Chi- square test was used to determine the population dynamics. Regression analyses of dependent variables

were used after calculating their regression constant, regression correlation and correlation factors of the crabs. Scatter diagrams were plotted for the specimens to illustrate the relationship between the total or carapace lengths and weight of the crabs. The log of total or carapace lengths and weight were obtained and plotted in order to establish the relationship between them.

RESULT

Growth pattern

A total of 501 crabs of *Sersama huzardii* were obtained from the mangrove swamp with carapace length ranging from 0.8cm to 4.0cm (carapace width 0.8.cm – 3.3cm) and weight from 3.3g to 25.66g. The size frequency distribution is showed in Fig.2. The crabs exhibited a unimodal size distribution and were of the same age group in the first year of life.

The length-weight relationship of *S. huzardii* showed no linear relationship between the length and the weight of the crabs. The length-weight relationship values for *S. huzardii* throughout the months of March to August, 2012 were Log W= Log 0.6932 + 0.8787 Log L (n = 501, r = 0.4665). The values of the regression coefficient "b" were 0.767, 1.353, 0.619, 0.444, 0.280, 0.823 and 0.8787, which showed that the mangrove crabs exhibited a very low negative allometric growth. The correlation coefficient (r) was 0.4665 for *S. huzardii*, which showed a very low correlation between the carapace length and weight in *S. huzardii.* The condition factor (K) which indicated the state or overall well-being of the crab is given in Table 1. The K- values ranged between 18.4 and 37.9. *S. huzardii* were examined for food and feeding habits. Analysis of the stomach contents and the feeding habit show that *Sersama hurazdii* are opportunistic omnivores as stomach content showed *Navicula cuspidate*, *Nitzschia linearis is*, blue green algae, *Sctonema* sp, *Oscillatoria limnosa*, sand grains and unidentified material. The crabs fed mainly on five food items which include algae filament, plant material, *Navicula cuspidata, Nitzschia linearis* and numerous unidentified material. By numerical method, for *Sersarma huzadii* algae filament was 34.8%,*Nitzschia linaeris* had 26.5%, *Navicula cuspidata* was the most important with 36.9%.,the least important was *Oscillatoria limnosa* 1.6% By the frequency of occurrence for *Sersarma huzadii*, *Navicula cuspidata* also consist the most important food items with 1.31%, *Nitzschia linearis* with 0.69%,and algae filament was 0.93and *Oscillatoria limnosa* 0.22%.

Sex ratio

Out of 501 crabs caught for *Sesarma huzardii*,363 were male while 138 were female and the sex ratio was 1:0.38 .A chi-square test indicated that this ratio was significantly ($p<0.05$) different from the expected 1:1

Fecundity

Egg counts were made and three female were ovigerous out of 501 crabs with total egg weight of 3.3g, 0.99g, 0.34g and carapace length of 2.0, 3.0 and 3.0cm respectively. The average fecundity estimate was 3.5 million.

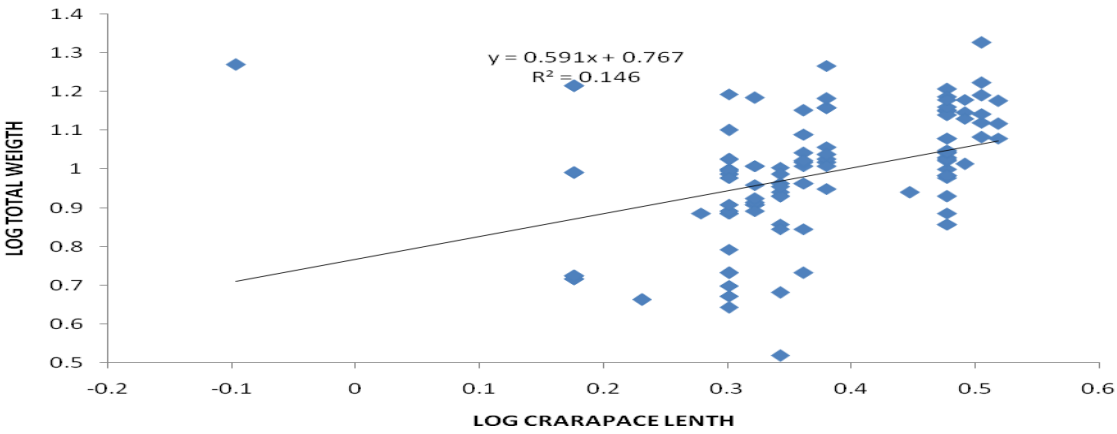

Fig:1 Log Total Weight-Log Carapace Length Relationship in March 2012

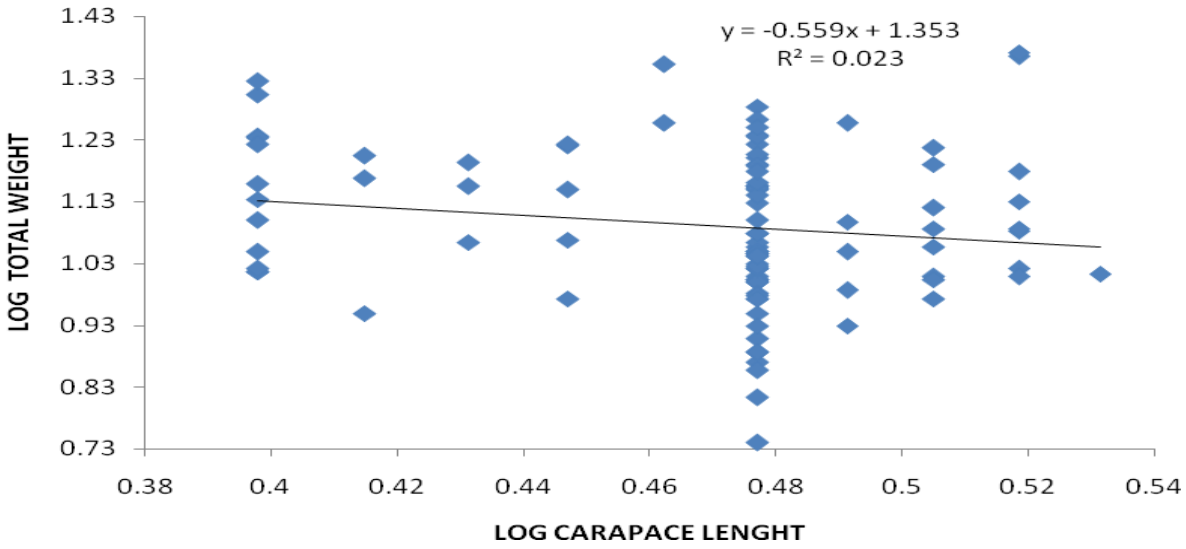

Fig:2 Log Total Weight/Log Carapace Length Relationship in April 2012

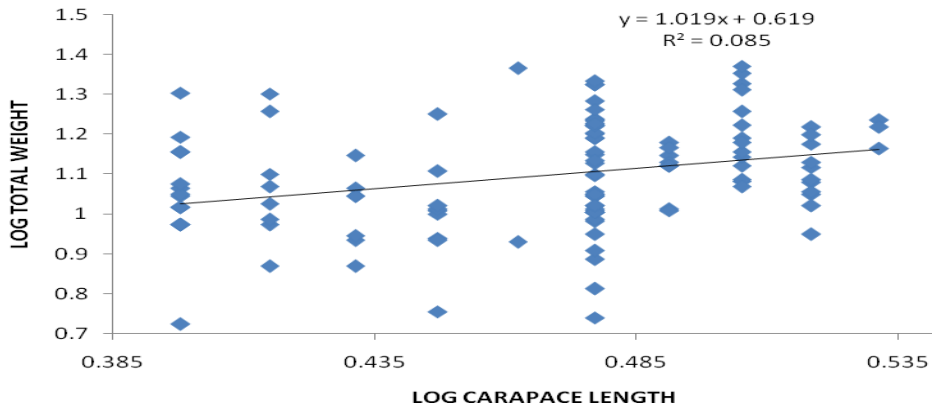

Fig:3 Log Total Weight/Log Carapace Length Relationship in May 2012

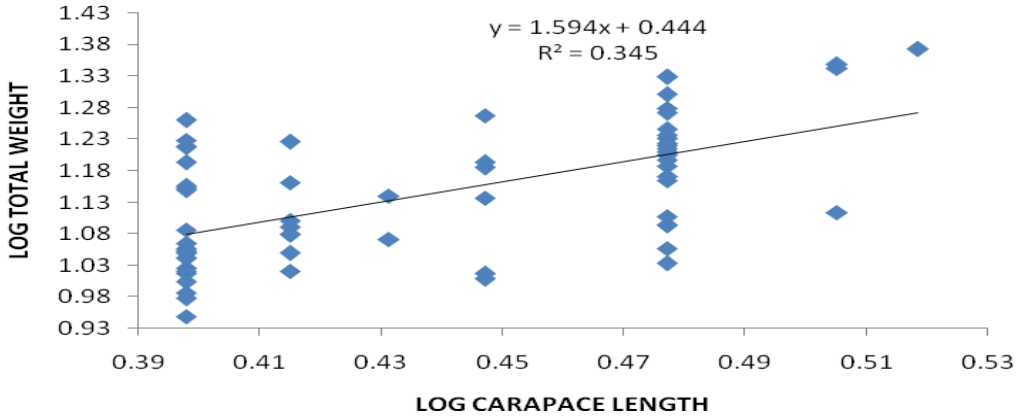

Fig:4 Log Total Weight/Log Carapace Length Relationship in June 2012

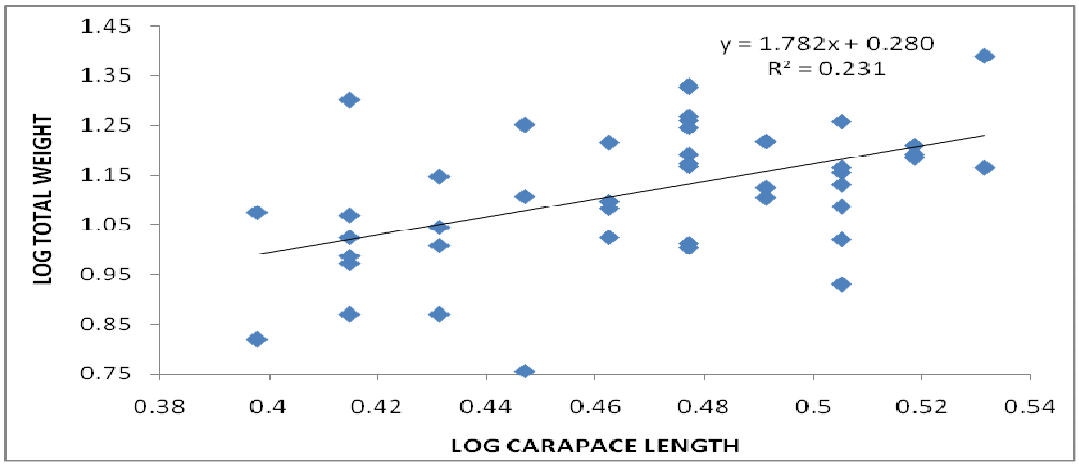

Fig: 5 Log Total Weight/Log Carapace Length Relationship in July 2012

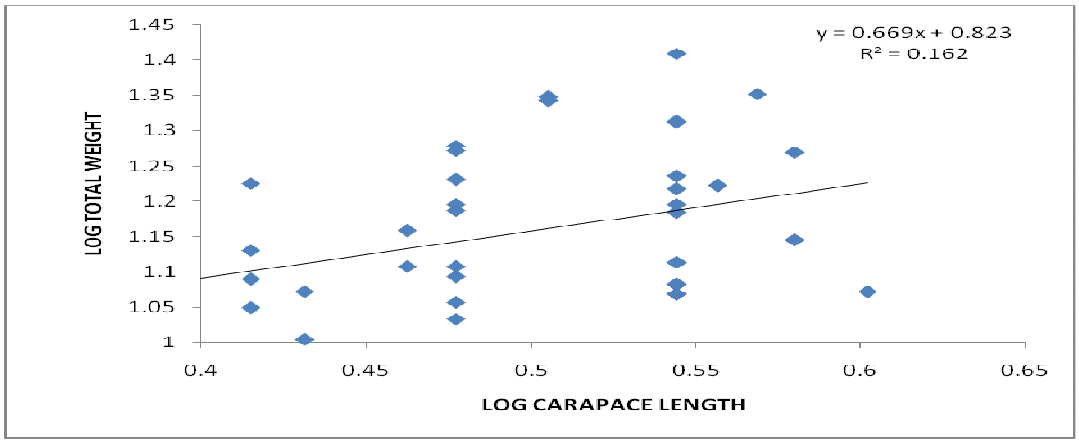

Fig 6: Log Total Weight/Log Carapace Length Relationship in August 2012

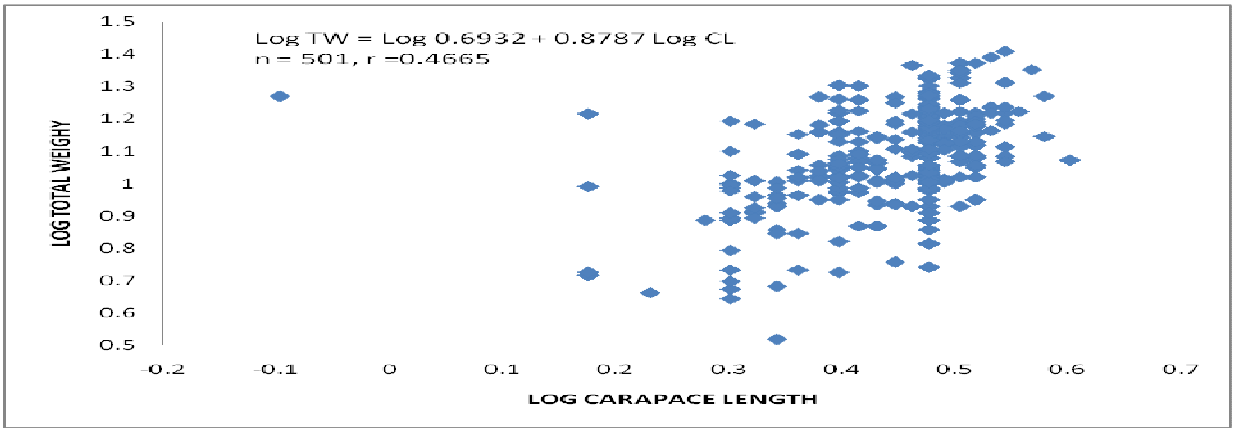

Fig:7 Summary of the Log Total Weight/Log Carapace Length Relationship throughout the March-August 2012,

Table 1: - Monthly Condition factor K by size group of ***Sesarma huzardii*** from March-August 2012

CL(CM)	FEMALE				MALE				COMBINE SEXES			
	N	TL	TW	K	N	TL	TW	K	N	TL	TW	K
0.8-1.2									1	0.8	18.6	3633
1.2-0.5	1	1.5	16.4	485	7	1.5	8.1	240	8	1.5	9.2	273
1.6-2.0	1	11.5	16.4	1.1	3	1.8	5.6	96.02	3	1.8	5.63	96.5
2.0-2.4	18	2.1	9.2	99.34	42	2.1	8.6	0.077	61	2.1	8.7	93.9
2.4-2.8	21	2.6	11.47	65.3	97	2.5	12.1	48.9	115	2.5	12	76.8
2.8-32	60	2.9	13.62	55.8	160	3	13.2	48.9	85	3	13.3	49.3
3.2-3.6	30	3.3	15.4	42.94	59	3.3	15.3	42.6	6	3.3	15.31	42.6
3.6-4.0	27	3.3	15.36	42.74	6	3.7	17.1	33.76	6	3.7	17.08	33.7
4.0-4.4	-	-	-	-	2	4	11.8	18.44	2	4	11.8	18.4
TOTAL	501											

KEY
CL= Carapace length(cm)
WT= Total weight(g)
K= Condition factor
N= Number

Table 2: Monthly variation of empty stomach for *Sesarma huzardii* from Lagos lagoon (March-August) 2012

Month	*Sesarma huzardii*	% of empty stomach
March	120	20.8
April	101	5
May	120	46.7
June	65	20
July	43	20.9
August	52	48.1
Total	501	

Table 3: Summary of stomach content *Sesarma huzardii* from Lagos lagoon front from March – August, 2012

FOOD ITEM	NUMERICAL METHOD		FREQUENCY OF OCCURRENCE	
	number	percentage	number	percentage
Algea (blue-green)	9630	34.8	255	2.988%
Navicula custidate	10205	36.9	360	27.69%
Nitzschia linearis	7335	26.5	190	33.17%
Oscillatoria limnosa	465	1.6	61	13.45%
Plant material	-	-	-	-
Unidentified material	-	-	-	-
Sand grains	-	-	-	-
Total	27636	100.00		

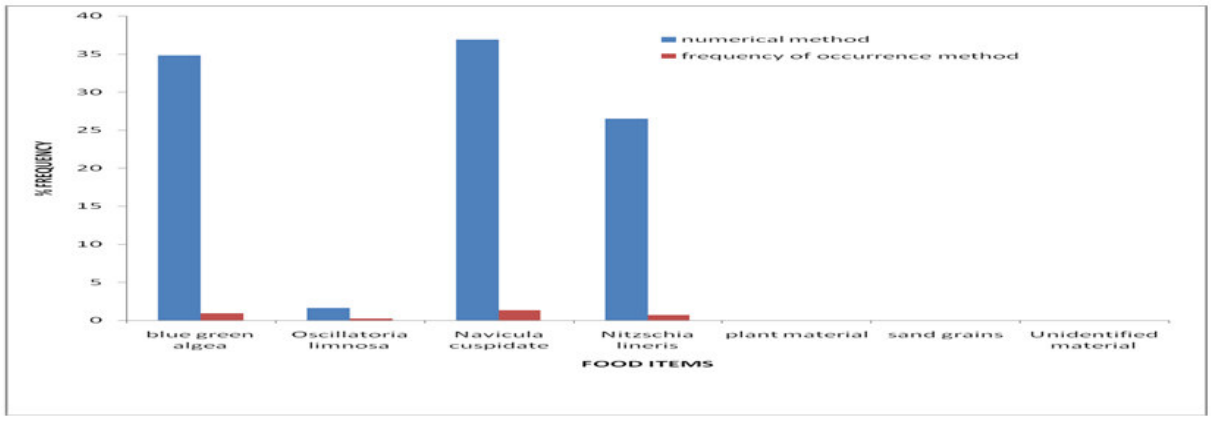

Fig 8: Summary of food items/percentage frequency *Sesarma huzardii* from March – August, 2012.

Table 8: - Summary of sex ratio of *Sesarma huzardii* from Lagos Lagoon from March- August, 2012.

Month	Total	Male	Female	Sex ratio male: female	Chi-square
March	120	84	36	1:0.4	19.2
April	101	74	27	1:0.4	21.9
May	120	83	37	1:0.5	17.6
June	65	38	27	1:0.7	1.86
July	43	41	2	1:0.1	35.37
August	52	43	9	1:0.2	0.22
Total	501	363	138	1:0.38	101.05

DISCUSSION

The carapace length of *S.huzardii* ranged from 0.8cm-4.0cm which showed a unimodal size distribution.Unimodal size frequency was reported by Kwei (1978) for *C.latimanus* in two Ghanaian lagoons while Lawal-Are and Kusemiju (2000) documented it for *C. amnicola* in Badagry Lagoon.. The Atlantic mangrove fiddler has a maximum carapace length of about 1.9 cm (Kaplan 1988)

The correlation coefficient (r) in the crabs (0.4665 for S.huzardii) was very low indicating that there was no linear relationship between length and weight in *S. huzardii* which is contrary to very high correlation between length and weight reported by Kwei (1978) and Lawal-Are and Kusemiju (2000) for *Callinectes sp. Sesarma huzardii* and *Uca tangeri* has been reported showing in linear growth relationship with several part of the body

The Analysis of the stomach contents and the feeding habit show that *Sersame hurazdii* to be opportunistic feeders showed By numerical method,algae filament was 34.8%,*Nitzschia lineris* had 26.5%, *Navicula cuspidate* was the most important with 36.9%.,the least important was *Oscillatoria limnosa* 1.6% By the frequency of occurrence *Navicula cusipadate* also consist the most important food items with 1.31%,*Nitzschia linearis* with 0.69%,and algae filament was 0.93and *Oscillatoria limnosa* 0.22% These were items commonly found in the mangrove swamps inhabited by the crab with the diatoms and algae coming in with the tidal water. Warner (1977) reported that crabs were opportunistic carnivore and this type of feeding was common in *Carcinus sp*, *Cancer pagurus* and *C.sapidus*.

The condition factor (K) for the mangrove crabs ranged from 18.4 for S.huzardii ,lawal and Hillary 2011 reported a ranged from 3.1 to 18.8 for S.huzardii and varied in relation to size of the crabs while Okon and Sikoki 2014 reported The values of the condition factor ranged between 8.43 and 10.79 from Mbo river in Akwa Ibom , Lawal-are and Kusemiju (2000) reported values of 5.67 to 9.97 for the blue crab, *Callinectes amnicola* in the adjacent Badagry Lagoon.

The male crabs were significantly more numerous than female crabs, the total sex ratio was 1:0.38 which is different from the expected 1:1 ratio. The Chi-square calculated showed that the different was significant because the calcuated value was higher than the tabulated value.

Three female that were ovigerous out of 501 crabs with total weight of 3.3g,0.99g,0.34g with CL of 2.0,3.0 and 3.0cm respectively. And the eggs estimate to 1.1-2.5million.Out of about 3 million eggs produced by a female ,a very few are likely to survive to adult stage due to stress as a result of high wave and tide influence which sweep most of the egg out of the water, (Wakefield,2002).Lawal-Are and Hilary 2011 reported that Fecundity in *S. huzardii* was very high (1.2-3.5 million eggs). High fecundity has been reported in crab species. Kwei (1978) reported 1.9-2.8 million eggs in *C. latimanus* while Guillory *et. al.*(1996) documented mean fecundity of 3.2 million eggs for *C. sapidus*. According to Shields *et. al.* (1990), variations in fecundity may be

caused by several ecological factors including habitat and biological constraints.

CONCLUSION

The size composition, growth pattern, food habits, reproductive biology are comparable to works done by earlier researchers in other water bodies, implying that Lagos lagoon was suitable for commercial crab production and the very high condition factor is an indication of the well-being of the species. There is a great need for a conscientious effort in the development of commercial crab culture in Nigeria

REFERENCES

Ajana, A.M. (1996). Survey of Coastal and Brackish water Shellfish Fisheries of Delta State.A Refils Report for the National Agricultural Research Project(NARP).Nigeria Institute for Oceanography and Marine Research(NIOMR),Lagos

Awosika, L., Osuntogun, N., Oyewo, E. and Awobamise, A. (2002):global environment facilities, Nigeria National Report Phase 1: Integrated problem analysis, development of the coastal and marine environment in sub Sahara Africa"GEF MSP Suharan Africa Project(GF/6010-0016);10-11

Adamezewska, A. M., Van Aardt, W. J. and Morns, S. (1997). Role of lungs and gills in African Freshwater crab, *Potamonautes warreni* (Decapoda:Potamordea) in gas exchange with water, air and during exercise, *Journal of Crustacean Biology* 17: 596-608.

Bagenal, T.B. (1978). Aspect of fish fecundity. In: S.D. Gerking, (Ed.), *Method of Assessment of Ecology of Freshwater Fish Production*, Blackwell Scientific Publications, Blackwell, Oxford; 75-101.

Bannister, J.V. (1976). The length – weight relationship, condition factor and gut contents of the Dolphin fish, *Coryphaena hippurus* (L) in the Mediterranean. *Journal of Fish Biology*, 9: 335-338.

Boschi, E.E. (2000a). Biodiversity of marine decapod brachyurans of the Americas.*Journal of Crustacean Biology*, 2: 337

Cannicci, S., Dahdouh – Guebas F., Anyaona, D. and Vannini, M. (1995). Homing in the mangrove swimming crab, *Thalamita crenata* (Decapoda; Portunidae), *Ethnology,* 100: 424-452.

Chukwu, L.O. (2002). Ecological effects of human induced stressors on coastal ecosystems in southwestern Nigeria. PIM 2002 Conference: The ocean in the New economy. Held in Cape Town, South Africa between 8 – 14, December, 2002. 61 – 70.

Cumberlidge, N. (1999). *The freshwater crabs of West Africa*. Family Potamanautidae Paris. IRD. Collection of fauna and flora in the Tropics.236pp.

Fransozo, A. and Negreiros-Fransozo, M.L. (1996). Brazilian coastal Crustacea Decapoda. In: Biodiversity in Brazil:141 A First Approach (de Bicudo CE, Menezes MNA, eds). Proceedings of the Workshop Methods for the assessment of biodiversity in plants and animals,Campos do Jordão, São Paulo, Brazil, 26-30 May 1996,CNPq – Conselho Nacional de Desenvolvimento Científicoe Tecnológico. 275-287, São Paul

Gillikin, D.P. (2004).Osmoregulatory ability of *Chiromantes ortmanni* (Crosnier, 1965) subjected to dilute and hypersaline seawater. *Crustaceana*, 77(1): 67 -74.

Guillory, V., Prejean, E., Bourgeois, M., Burdon, J. and Merrell, J. (1996).A biological and fisheries profile of the blue crab, *Callinectes sapidus*. L. A. Department of Wildlife and Fisheries Management Plan Series, 8(1), 210pp.

Morris, S. and Van Aardt W.J. (1998). Salt and water relations and nitrogen excretion, in the amphibious African freshwater crab *Potamonautes warren* in water and in air. *Journal of Experimental Biology*; 201: 883-893.

Ng P.K.L., Guinot, D. and Davie, P.J.F.(2008). Systema brachyurorum: Part I. An annotated checklist of extant brachyuran crabs of the world. *The Raffles Bulletin of Zoology*, 17: 1-286

Kwei,E.A,(1976) Size,compostion,growth and sexual maturity of callinectes latimanus (Rath) in two Ghanaians lagoons,*Zoology journal Linnaeus society* 64,151-157.

Lawal – Are, A.O. (2010). Reproductive Biology of the Blue Crab, *Callinectes amnicola* (De Rocheburne) in the Lagos Lagoon, Nigeria. *Turkish Journal of Fisheries and Aquatic Sciences,* 10: 1-7.

Lawal – Are, A.O. and Kusemiju, K. (2000). Size composition, growth pattern and feeding habits of the blue crab, *Callinectes amnicola (*De Rocheburne) in the Badagry Lagoon, Nigeria. *Journal of Scientific Research and Development,* 5:169-176.

Lawal-Are, A.O. (2009).Food and feeding habits of the blue crabs, *Callinectes amnicola*(De Rocheburne) from three different interconnecting lagoons in South-West, Nigeria. *European Journal of Scientific Research,* 32 (1): 89-95.

Lawal-Are,A.O. (2006).Thesis:the biology and the Culure of potentials of the blue crabs, *Callinectes amnicola*(De Rocheburne) from Badagry, Lagos Lekki lagoon, southwest Nigeria.

Levinton, J., Sturmbauer, C., and Christy, J. (1996). Molecular data and biogeography: resolution of a

controversy over evolutionary history of a pan-tropical group of invertebrates. *J. Exp. Mar. Biol. Ecol.*, 203: 117-131.

Lourenco, R., Paula, J. and Henriques, M., (2000). Estimating the size of *Uca tangeri* (Crustacea: Ocypodidae) without massive crab capture. *Scientia Marina,* 64: 437- 439.

Onyema, I. C. & Ojo, A. A. (2008). The zooplankton dynamics and chlorophyll a concentration of a tropical tidal creek in relation to

Onyema, I. C., Otudeko, O. G. and Nwankwo, D. I. (2003). The distribution and composition of plankton around a sewage disposal

Onyema, I. C., Otudeko, O. G. and Nwankwo, D. I. (2003). The distribution and composition of plankton around a sewage disposal

Oyenekan, J.A. (1995). Growth patterns in three brachyuran crabs in Lagos, Nigeria. *Archie Hydrobiologia,* 134(4): 533-546.

Parsons, R. (1988). Statistical analysis – a decision making approach. Second edition. Harper and Row Publishers, New York. 791pp.

Shields, J.D., Okazaki, R.K. and Kurts, A.M. (1990). Fecundity and the reproductive potential of the yellow rock crab, *Cancer anthonyi. Fishery Bulletin, US*, 89: 299-305. Site at Iddo, *Nigeria. Journal of Scientific Research Development.7*: 11-26.

Webb, J. E. (1958a). The Ecology of Lagos lagoon. 1: The lagoons of the Guinea Coast. *Philosophical Transaction Royal Society London. Ser B* 241-283.