# COMPARATIVE STUDY OF SOME ASPECTS OF BIOLOGY OF THREE MANGROVE CRABS FROM THE MANGROVE WETLAND OF LAGOS LAGOON, NIGERIA

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***ABSTRACT***

*The size composition, growth pattern and feeding habit of 395 crab specimens of the hairy mangrove crab - S. huzardii, fiddler crab - U. tangeri and land crab - C. armatum collected from the mangrove swamp of the Lagos Lagoon were examined for six months. The carapace length of S. huzardii ranged from 1.70 cm – 4.60 cm (Carapace width from 1.90 cm - 3.60 cm) whilst that of U. tangeri ranged from 1.10 cm - 3.60 cm (Carapace width from 1.40 cm - 4.20 cm) and C. armatum 4.50 cm - 9.50 cm (Carapace width from 4.60 cm - 9.80 cm). The total weight of S .huzardii ranged from 8.10 - 23.50 g, from 2.00 g - 27.30 g in U. tangeri, and ranged from 39.10 g - 131.80 g in C. armatum. The crabs exhibited allometric growth. The condition factor K ranged from 20.0 – 1.01 cm in S. huzardii, 1.50 - 2.76 cm in U. tangeri and 14.0 - 67.8 cm in C. armatum. 44 out of 150 specimens of S. huzardii had empty stomach, 38 out of the 125 specimens of U. tangeri had empty stomach while 26 out the 120 specimens of C. armatum had empty stomach. The stomach content of these three ecological related crustaceans showed S. huzardii fed mainly on diatoms, detritus, protozoa, filamentous algae; U. tangeri fed mainly on detritus, diatoms, protozoa, green algae, plant materials and sand grains; while C. armatum fed mainly phytoplankton, zooplankton, plant materials and sand grains. There was evidence of interspecific competition amongst this group of crustaceans, although each had been able to survive adequately. The sex.ratio in S. huzardii was 1:0.4, 1:0.4 in U. tangeri and 1:1.1 in C. armatum.*

**Keywords**: Growth pattern, Stomach contents, *S. huzardii, U. tangeri, C. armatum*

## INTRODUCTION

Shellfishes consist of terrestrial and aquatic animals including lobsters, oysters, crabs, shrimps, prawns, crayfish and barnacles. The aquatic crustaceans are the majority and live in either freshwater or marine habitat while terrestrial crustaceans live in holes made on waterlogged land. The family Gecarcindae consists of the land crab, which do not live far from water and are well adapted to life on land. The accessibility of crabs has made them the most widely studied among the group crustaceans (Warmer 1977). Observation showed that differences in the growth rate of different parts of the body leading to change in shape and sizes in respect to time determine the growth in these species. (Hartnoll 1968). Considerable studies including those of Gifford (1962), Warner (1977), Lawal-Are and Kusemiju (2000) and Lawal-Are (2003) had been done in area of the biology of crustaceans particularly *Cardiosoma armatum* and *Callinectes amnicola.*

Oyenekan and Adediran (1987) studied the growth pattern of *Cardiosoma armatum* in the Lagos lagoon alongside other crabs. The authors reported that *Cardiosoma armatum* inhabited mangrove mudflat of the Lagoon and were abundant between March and November each year. The linear growth relationship with several part of the body of *Uca*

*tangeri* and *Sesarma huzardii* was also reported. Lawal-Are (2003) studied the aspect of biology of the Lagoon crabs *Callinectes amnicola* in Badagry, Lagos and Lekki lagoon. A review taxonomy and systematic of the brachyurans in general has been carried out by Rathbun (1897) and Warner (1977). Gifford (1962) carried out some studies on the biology of this species in south Florida. Extended work has also been done on the aspect of biology of several other species of *Cardiosoma* (Oyenekan and Adediran, 1987, Hill, 2001).

*Uca tangeri* (Family *Ocypodidae*) is the largest species in the genus *Uca*, with a *carapace* width of about 50 mm (and carapace length up to 25 mm). The males have one claw much larger than the other, which they use for communication. *Uca tangeri* was first described by Eydoux (1835) as *Gelasimus tangeri* and commonly called African fiddler crab or "calling crab" (FAO, 1990, Rosenberg, 2001). There are now 97 recognized species, compared to the 67 species and numerous subspecies (Christy, 2007).

Fiddler crabs are found along sea beaches and brackish inter-tidal mud flats, lagoons and swamps (Wolfrath, 1992). They are found in mangroves, in salt marshes, and on sandy or muddy beaches of West Africa, the Western Atlantic, the Eastern Pacific and the Indo-Pacific. Fiddler crabs are easily recognized by their distinctively asymmetric claws. *Sesarma* (Family Grapsidae) is the notable members of the crabs array of species inhabiting adjoining mangrove in Lagos lagoon. They live beneath drift of high tide mark (Gross, 1957). Gillikin and Kamanu (2005) stated that *Sesarma huzardii* are amphibious in habit and can be found around the intertidal areas to moist/wet muddier region of the mangrove. The *Sesarma* are the most dominant crabs in the mangrove due to their ability to live in the extreme environment (Cannicci *et. al.,* 1995). *Cardiosoma armatum* (Land Crab) is specially adapted for terrestrial existence. They belong to the Family Gecarcinidae. They are associated with water at one period or the other in their life cycle especially during reproduction. Land crabs are vegetarian and occasionally feed on large insects (Dahdouh - Guebas, 1997). *Cardisoma guanhumi* is omnivorous, collecting and eating leaves and fruits close to its burrow whilst also eating insects and carrion. Like many crabs, this species is *cannibalistic* (Hill, 2001).

An array of food items which include: algae, anomuran, brachyuran and other crustaceans, foraminaferans, gastropods, bivalves, pisces, polychaeta, polyplacora, mangrove detritus and sand occur in the mangrove ecosystem where they are found (Dahdouh-Guebas *et. al.*, 1997). Primitively, Crabs were opportunistic omnivores having predatory tendencies. *Uca tangeri* feed by scrapping off the upper 2-3mm of the sediment with its minor chelae. The main sources of food for *Uca* species was reported to be plankton and detritus (Marshall and Orr, 1960). Mangrove material was the main component of crabs diet, it constituted 45.4% of *Metagrapsus curvatus* diet, 55% *Sesarma elegans* diet, 62.5% *Sesarma alberti*, 65.9% *Goniopsis pelii* diet, 47.8% *Sesarma huzardi* diet and 37.3% *Grapsus grapsus* diet. Damage on young mangrove trees was highly correlated to the number of crabs on trees ($r^2 = 0.75$) Longonje and Raffaelli (2014). Crabs show distinct preference for different propagule species.

*Avicennia* propagules are the most preferred because they contain simple sugars, low tannin, fibre and protein (Smith, 1987).

The study objective is to provide information on the length-weight relationship, food and feeding habit, sex ratio and growth pattern of three crab species in the mangrove wetlands of Lagos Lagoon.

## MATERIALS AND METHODS

### Description of Study Site

The Lagos Lagoon is the largest of the lagoon system with an estimated surface area of 209 $km^2$. It is located between latitudes 6°26'N and 6°39'N and longitude 3°29'E and 3° 50'E (Fig. 1a). The mangrove area of the Lagos Lagoon is shallow and under increasing tidal influence especially during the dry season with more flood waters during the rainy season. The mangrove site is exposed throughout the year to the semi-diurnal tide (Olaniyan, 1969; Nwankwo and Akinsoji, 1992; Lawal-Are and Kusemiju, 2011).

### Collection of Specimens

Specimens of mangrove crabs (*Sesarma huzardii, Uca tangeri and Cardiosoma armatum*) were collected using hand nets (ranging from 44-76mm) from the mangrove swamps/forests behind the Bariga end to University of Lagos main library, behind the Zoological Garden/University of Lagos Lagoon front and the axis of the Vice-Chancellor Lodge, a distance of about 1km apart (Fig. 1b). The specimens were caught monthly for a period of six months (March - August, 2009) between 7.00 and 10.00 hrs. A total number of 395 specimens were collected and the specimens were immediately preserved in an ice-chest with ice-blocks, and later transferred into a deep freezer (-20°C) in the laboratory prior to analysis.

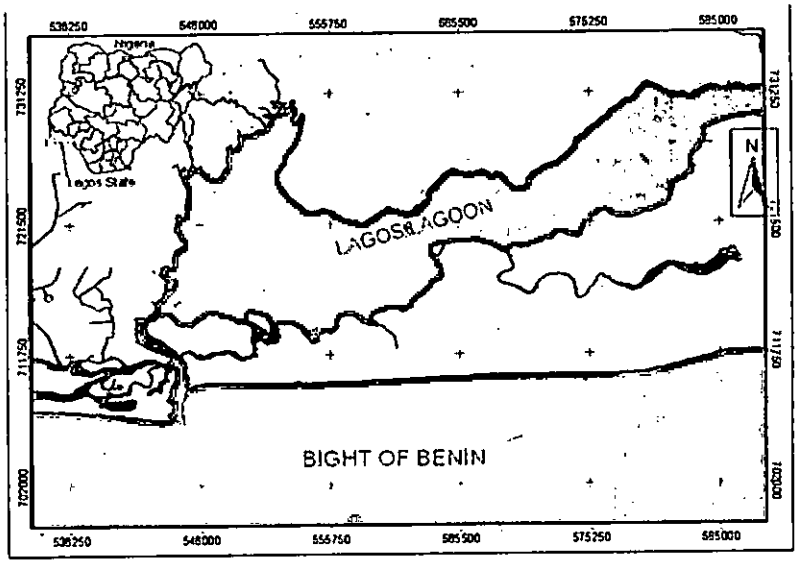

Fig. 1a: Lagos Lagoon

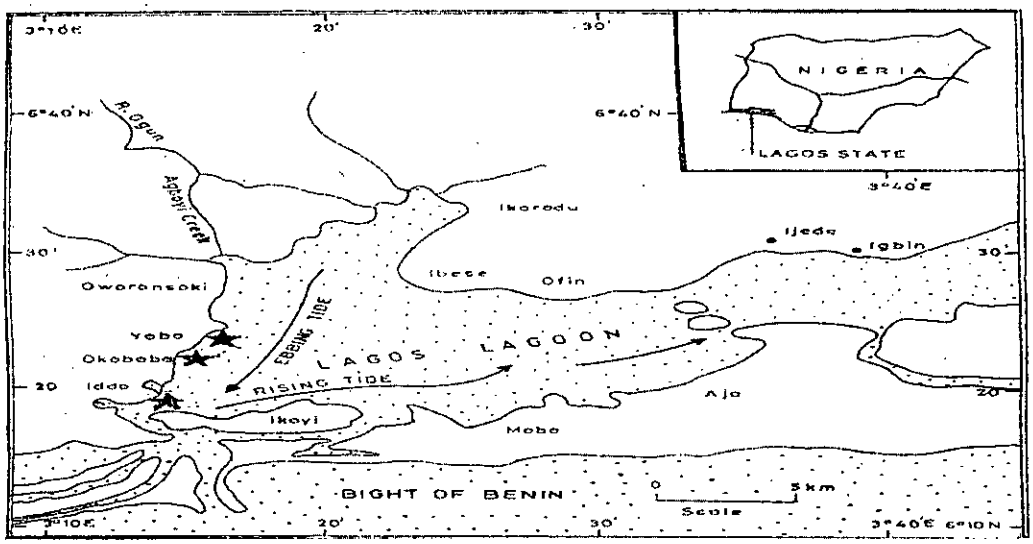


Fig. 1b: Map of Lagos Lagoon (Sampling site)

**Laboratory Procedure**

The carapace length (CL) of the crabs were measured from the edge of the frontal region to the tip of the carapace backwall using a 0.05cm precision Vernier caliper, while the carapace width (CW) was measured from the tip of the left side to the right to the nearest 0.01cm. The total weight of the crab was taken to the nearest tenth of a gram on a Sartorius top loading balance (Model 1106).

The carapace-length/weight relationship was expressed by

$$\text{Log } W = \text{Log } a + b \text{ Log } L \quad \ldots\ldots\ldots\ldots \text{ Eq. 1 (Parsons, 1988)}$$

where W = weight of crab in g, L = carapace length in cm, a = regression constant and b = regression co-efficient.

The condition factor (K) of the crab was determined using the formula:

$$K = \frac{100W}{Lb} \quad \ldots\ldots\ldots\ldots \text{ Eq. 2 (Bannister, 1976).}$$

where W = weight of the crab in g, L = carapace length in cm, b = regression co-efficient.

For the food analysis, the cardiac stomach of each specimen was dissected out and the contents examined under a binocular microscope. The food analysis was by the numerical and the frequency of occurrence methods (Kwei, 1978 and Hyslop, 1980).

Sex was determined using the shape of the abdomen as describe by Kwei (1978). The abdomen, or tail flap, which is folded closely against the underside of the crab, is much broader in the female than in the male crab. This broad tail flap is necessary in the female

to accommodate at spawning time the huge numbers of eggs that are attached and receive protection between this flap and the body until hatched in the adult stage. A male crab has long narrow inverted "T" shaped abdomen while an immature female (juvenile) has an inverted "V" shaped abdomen and the mature (adult) female crab had an inverted 'U' shaped abdomen.

## RESULTS

### Size Composition

A total of 395 crab specimens were caught {150 of *Sesarma huzardii* (Plate1a), 125 of *Uca tangeri* (Plate1b) and 120 *Cardiosoma armatum* (Plate1c)}and examined in this study during the period of March to August 2009.

The size composition of *S. huzardii, U. tangeri* and *C. armatum* are shown in Table 1 and 2. Size ranged in *S .huzardii* was from1.70 to 4.60 cm, (CW: 1.90 – 3.60 cm, weight: 8.10 – 23.50 g). In *U. tangeri,* the sizes ranged from 1.10 - 3.60 cm. (CW: 1.40 - 4.20 cm, weight: 2.00 - 27.30 g), while in *C. armatum,* the sizes ranged from 4.50 - 9.50 cm (CW: 4.60 - 9.80 cm and weight: 39.1 - 131.8 g).

Plate 1a: *S.huzardi*

Plate 1b: *U.tangeri*

Plate 1c: *C.armatum*

Table 1: Carapace Length distribution amongst crabs *Sesarma huzardii, Uca tangeri* and *Cardiosoma armatum* from mangrove area of Lagos Lagoon

| Carapace Length (range in cm) | *Sersama huzardii* | | *Uca tangeri* | | *Cardiosoma armatum* | |
|---|---|---|---|---|---|---|
| | Male | Female | Male | Female | Male | Female |
| 1.0 – 1.4 | - | - | 17 | 8 | - | - |
| 1.5 – 1.9 | 3 | 3 | 32 | 7 | - | - |
| 2.0 – 2.4 | 14 | 18 | 18 | 9 | - | - |
| 2.5 – 2.9 | 59 | 20 | 12 | 5 | - | - |
| 3.0 – 3.4 | 21 | 4 | 4 | 5 | - | - |
| 3.5 – 3.9 | 7 | - | 8 | - | - | - |
| 4.5 – 4.9 | 1 | - | - | - | - | - |
| 4.5 – 5.4 | - | - | - | - | 1 | 2 |
| 5.5 – 6.4 | - | - | - | - | 22 | 24 |
| 6.5 – 7.4 | - | - | - | - | 21 | 31 |
| 7.5 – 8.4 | - | - | - | - | 8 | 5 |
| 8.5 – 9.4 | - | - | - | - | 2 | 2 |
| 9.5 – 10.4 | - | - | - | - | 1 | 1 |
| TOTAL | 105 | 45 | 91 | 34 | 55 | 65 |

Table 2: Carapace Width distribution amongst crabs *Sesarma huzardii, Uca tangeri* and *Cardiosoma armatum* from mangrove area of Lagos Lagoon

| Carapace width (range in cm) | *Sersama huzardii* | | *Uca tangeri* | | *Cardiosoma armatum* | |
|---|---|---|---|---|---|---|
| | Male | Female | Male | Female | Male | Female |
| 1.0-1.4 | - | - | 1 | - | - | - |
| 1.5 - 1.9 | 1 | - | 7 | 2 | - | - |
| 2.0 - 2.4 | 9 | 8 | 31 | 10 | - | - |
| 2.5 - 2.9 | 40 | 20 | 19 | 9 | - | - |
| 3.0 - 3.4 | 50 | 17 | 18 | 6 | - | - |
| 3.5 - 3.9 | 5 | - | 5 | 5 | - | - |
| 4.0 - 4.4 | - | - | 10 | 2 | - | - |
| 4.5 - 5.4 | - | - | - | - | - | 1 |
| 5.5 -6.4 | - | - | - | - | 12 | 14 |
| 6.5- 7.4 | - | - | - | - | 26 | 37 |
| 7.5 - 8.4 | - | - | - | - | 11 | 8 |
| 8.5 - 9.4 | - | - | - | - | 5 | 3 |
| 9.5 -10.4 | - | - | - | - | 1 | 2 |
| TOTAL | 105 | 45 | 91 | 34 | 55 | 65 |

**Growth Pattern**

The relative growth in *Sesarma huzardii, Uca tangeri* and *Cardiosoma armatum* showed an increase in length with increasing weight as in Fig. 2.

Carapace Length/Width and Total Weight Relationship

The log length-log weight showed a linear relationship between the length and weight of the crabs.

**Carapace length**

| | |
|---|---|
| *Sersama huzardii:* (n = 150, r = 0.4450) | Log Y = 0.4548 + 1.8716 Log X |
| *Uca tangeri:* (n = 125, r = 0.5006). | Log Y= -0.4676 + 1.3767 Log X |
| *Cardiosoma armatum:* (n = 120, r = 0.1627) | Log Y = -0.7399 + 1.4420 Log X |
| Carapace width | |
| *Sersama huzardii:* (n = 150, r = 0.4053) | Log Y = 0.3827 + 1.8123 Log X |
| *Uca tangeri:* (n = 125, r = 0.4261). | Log Y = 0.2381 + 1.5025 Log X |
| *Cardiosoma armatum*: (n = 120, r = 0.1811) | Log W = 0.6844 + 1.4790 Log X |

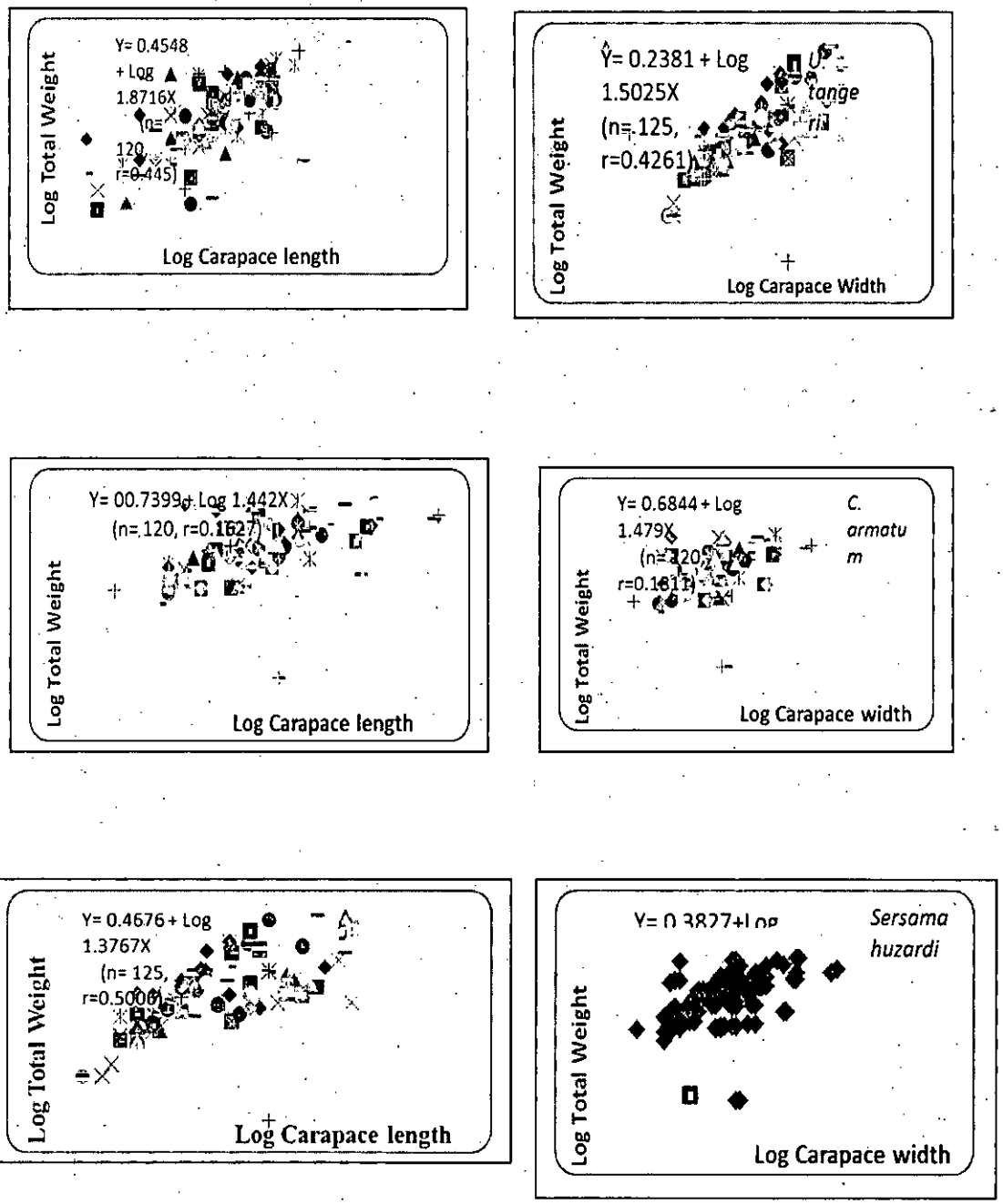


Fig 2: Log length/width relationship with Log weight of *Uca tangeri, Sesarma huzardii* and *Cardiosoma armatum* from mangrove area of Lagos Lagoon

**Condition Factor**

The condition factor (K) which indicated the state or overall well-being of the crab is given in Table 3. The K- values generally decreased with increase in size in all the crabs. Values ranged between 5.1 and 9.8 in *Sesarma huzardii* from 2.2 to 7.6 in *Uca tangeri* and between 1.1 and 6.4 in *Cardiosoma armatum.*

**Food Analysis**

A total of 44 (29.3%) of *Sesarma huzardii* had empty stomach, 38 (30.4%) of *Uca tangeri* had empty stomach while 26 (21.7%) of *Cardiosoma armatum* had empty stomach.

The crabs fed mainly on food items made up of detritus, plant materials, diatoms, protozoa, filamentous algae, green algae, sand grains, crab shells and Fish parts. By numerical method, detritus were the most important consisting of 40.6% of food items of *S. huzardii* and also by occurrence with 96.2.

By numerical method, detritus were the most important consisting of 51.3% of food items of *U. tangeri* and by occurrence with 98.9%. By numerical method, plant materials formed the main bulk of food items in *C. armatum* both for Numerical and Occurrence Method.

## Table 3: Summary of Condition Factor of *Sesarma huzardii, Uca tangeri* and *Cardiosoma armatum* from Mangrove area of Lagos Lagoon

| Carapace Width (range in cm) | *Sersama huzardii* | | | | | | | | *Uca tangeri* | | | | | | | | *Cardiosoma armatum* | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Male | | | | Female | | | | Male | | | | Female | | | | Male | | | | Female | | | |
| | N | CW | WT | K | N | CW | WT | K | N | CW | WT | K | N | CW | WT | K | N | CW | WT | K | N | CW | WT | K |
| 1.0 -1.4 | - | - | - | - | - | - | - | - | 1 | 1.4 | 1.8 | 7.6 | - | - | - | - | - | - | - | - | - | - | - | - |
| 1.5 - 1.9 | 1 | 1.9 | 5.2 | 7.4 | - | - | - | - | 7 | 1.8 | 2.8 | 5.0 | 2 | 1.9 | 3.3 | 5.3 | - | - | - | - | - | - | - | - |
| 2.0 - 2.4 | 9 | 2.3 | 8.5 | 7.5 | 8 | 2.3 | 9.4 | 7.7 | 31 | 2.3 | 5.7 | 5.0 | 10 | 2.1 | 4.1 | 4.4 | - | - | - | - | - | - | - | - |
| 2.5 - 2.9 | 40 | 2.9 | 17 | 7.4 | 20 | 2.7 | 12 | 6.1 | 19 | 2.7 | 10 | 5.0 | 9 | 2.7 | 6.7 | 3.6 | - | - | - | - | - | - | - | - |
| 3.0 - 3.4 | 50 | 3.1 | 30 | 9.8 | 17 | 3.1 | 18 | 6.3 | 18 | 3.1 | 13 | 4.3 | 6 | 3.2 | 6.5 | 2.0 | - | - | - | - | - | - | - | - |
| 3.5 - 3.9 | 5 | 3.6 | 23 | 5.1 | - | - | - | - | 5 | 3.7 | 19 | 3.6 | 5 | 3.7 | 10 | 2.0 | - | - | - | - | - | - | - | - |
| 4.0 - 4.4 | - | - | - | - | - | - | - | - | 10 | 4.1 | 20 | 3.0 | 2 | 4 | 14 | 2.2 | - | - | - | - | - | - | - | - |
| 4.5 - 5.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | 4.6 | 39 | 4.0 |
| 5.5 - 6.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 12 | 5.6 | 51 | 3.0 | 14 | 5.4 | 48 | 3.0 |
| 6.5 -7.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 26 | 6.5 | 63 | 2.3 | 37 | 6.4 | 53 | 2.0 |
| 7.5 - 8.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 11 | 7.2 | 65 | 1.8 | 8 | 7.4 | 60 | 1.5 |
| 8.5 - 9.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 5 | 8.2 | 68 | 1.2 | 3 | 8.4 | 62 | 1.1 |
| 9.5 -10.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | 9.8 | 132 | 1.4 | 2 | 9.8 | 121 | 1.3 |

Table 4: Stomach Contents of *Sesarma Huzardii* from the Mangrove Swamp of Lagos Lagoon

| Stomach Contents | Numerical method | | Occurrence method | |
|---|---|---|---|---|
| | Number | % | Number | % |
| Diatom | 1384 | 26.8 | 71 | 67.0 |
| Detritus | 2095 | 40.6 | 102 | 96.2 |
| Plant materials | 1480 | 28.6 | 77 | 72.6 |
| Protozoa | 134 | 2.6 | 39 | 36.8 |
| Filamentous algae | 73 | 1.4 | 38 | 35.8 |
| Sand grains | | | 42 | 48.3 |

Table 5: Stomach Contents of *Uca tangeri* from the Mangrove Swamp of Lagos Lagoon

| Stomach Contents | Numerical method | | Occurrence method | |
|---|---|---|---|---|
| | Number | % | Number | % |
| Diatom | 165 | 3.3 | 50 | 57.5 |
| Detritus | 2589 | 51.3 | 86 | 98.9 |
| Plant materials | 2040 | 40.4 | 76 | 87.4 |
| Protozoa | 152 | 3.0 | 40 | 46.0 |
| Green algae | 105 | 2.1 | 41 | 47.1 |
| Sand grains | | | 42 | 48.3 |

Table 6: Stomach Contents of *Cardiosoma armatum* from the Mangrove Swamp of Lagos Lagoon.

| Stomach Contents | Numerical method | | Occurrence method | |
|---|---|---|---|---|
| | Number | % | Number | % |
| Insect parts | 445 | 8.6 | 34 | 36.2 |
| Crab shells | 1260 | 24.3 | 78 | 83.0 |
| Green algae | 105 | 2.0 | 26 | 27.7 |
| Plant materials | 2845 | 54.8 | 94 | 100.0 |
| Detritus | 540 | 10.4 | 52 | 55.3 |
| Sand grains | | | 66 | 70.2 |

Sex Ratio

150 specimens of *S. huzardii* (105 Males and 45 Females), 125 of *U. tangeri* (91 Males and 34 Females) and 120 of *C. armatum* (55 Males and 65 Females) were examined. The sex ratio obtained for *S. huzardii* was 1:0:4, *U. tangeri* was 1:0.4, while *C. armatum* was 1:1.1.

Table 7: Sex Ratio of *Sesarma huzardii, Uca tangeri* and *Cardiosoma armatum* from mangrove area of Lagos Lagoon.

| Month/ Year | *Sesarma huzardii* | | | *Uca tangeri* | | | *Cardiosoma armatum* | | |
|---|---|---|---|---|---|---|---|---|---|
| | Male | Female | Ratio | Male | Female | Ratio | Male | Female | Ratio |
| March, 2009 | 23 | 2 | 1:0.1 | 17 | 3 | 1:0.2 | 9 | 11 | 1:1.2 |
| April, 2009 | 8 | 17 | 1:2.1 | 15 | 5 | 1:0.3 | 7 | 13 | 1:1.9 |
| May, 2009 | 20 | 5 | 1:0.3 | 13 | 2 | 1:0.2 | 7 | 13 | 1:1.9 |
| June, 2009 | 13 | 12 | 1:0.9 | 10 | 10 | 1:1 | 8 | 12 | 1:1.5 |
| July, 2009 | 18 | 7 | 1:0.4 | 22 | 3 | 1:0.1 | 11 | 9 | 1:0.8 |
| August, 2009 | 23 | 2 | 1:0.1 | 14 | 11 | 1:0.8 | 13 | 7 | 1:0.5 |
| Total | 105 | 45 | 1:0.4 | 91 | 34 | 1:0.4 | 55 | 65 | 1:1.2 |

## DISCUSSION

The linear growth relationship between carapace length/width and total weight of the three species of crab reflected a common general increase in weight with increasing carapace length and width. Similar observations were made by other studies including Oyenekan and Adediran (1987), Segun (1989), Fletcher *et al.* (1990), Lawal-Are (2003), Lawal-Are and Kusemiju (2011). The length frequency distribution showed a unimodal size distribution. According to Campbell and Eagle (1983), Lawson and Oloko (2013), frequency histograms with unimodal distribution are typical of many biological measurements.

The determination of age and growth rate investigation had not attracted much attention due to effect of Ecdysis resulting in the absence of annular structures in crabs. Thus, no direct method of determination of ages in crabs has been known as found in fishes (Diaz and Conde, 1989). The three species of crabs *U tangeri,* S. *huzardii* and *C. armatum* used for this study exhibited a positive allometric growth.

*U. tangeri* had more small sized crabs (72.8%) compared to *S. huzardii* (25.3%) and *C. armatum* (2.5%). *C. armatum* had larger crabs (15.8%) compared to that of *S. huzardii* (2%) and *U .tangeri* (6.4). While *U. tangeri* had more small sized crabs; C *armatum* had more medium and large sized crabs. This was also reported by FAO (1969).

The condition factor, K, varied with the size and sexes of crabs in the population. A high condition factor indicates that the crab is in good condition. The condition factor in the male crab particularly in the small-sized group decreased with increasing carapace width. This indicates successive growth as a result of molting activity. The older the crab, the more difficult it is for the crab to molt (Passano, 1960 and Prager, 1990). From this study, on the average, it was observed that the condition factor of the adult male crab of *U. tangeri, S. huzardii* and *C. armatum* were generally higher than the female in

conformity with Warner (1977) who noted that in true crabs: the males were generally larger than their co-specific females.

The number and variety of food items found in the individual stomach of *U. tangeri* and *S. huzardii* showed that the crabs mainly feed on detritus while in *C. armatum* showed that they fed mainly on plant materials in agreement to Dahdouh-Guebas (1997) for mangrove species. Crabs are foraging omnivores although certain families show tendencies towards more specialized diet (Warner, 1977 and Segun, 1989). The presence of sediment balls near the entrance to a burrow is a good indication of its occupation, as it was evidence in the stomach contents of these mangrove crabs as sand grains. Some experts believe that the feeding habits of fiddler crabs play a vital role in the preservation of wetland environments; by sifting through the sands, they aerate the substrate and prevent anaerobic conditions (Christy, 1984; Wolfrath, 1992; Gillikin and Kamanu, 2005).

There was no difference in the food items fed upon by the different size groups and no difference in the food item utilized by *U. tangeri* and *S. huzardii,* but *C. armatum* showed some differences in the food fed upon. The stomach contents of *U. tangeri* showed the presence of detritus, diatom, plant remains, protozoa, green algae and sand grains. The stomach contents of *S. huzardii* showed the presence of detritus, diatom, plant remains, protozoa, filamentous algae and sand grains, while the stomach of *C. armatum* showed the presence of crab shells, insect parts, green algae, plant materials and sand grains. However, no interspecific competition amongst crabs studied in agreement with Hines (1982), who observed that no interspecific reproductive patterns were apparent with respect to the variables of feeding type, salinity tolerance, habitat, and geographic range represented by the 20 species studied. This might have been due to the size of the crab and that of the chelipeds.

The sex ratio obtained for *S. huzardii, U. tangeri* and *C. armatum* was a clear-cut deviation from the expected ratio of 1:1. Warner (1977) was of the opinion that sex ratio is one of the major factors that determines the population of tropical brachyuran crabs that breeds continuously throughout the year. The author opined that the greater the difference in ratio the lesser the population.

The sex, gonad stage and maturity of the specimens investigated showed that there were no mature crabs in the samples. The crabs were in Stage I, II, III and a few males in Stage IV. No female of *U. tangeri* and *S. huzardii* while three specimen of *C. armatum* occurred in Stage IV. There was no berried female in the population which could be used for fecundity.

From this study, it was observed that *U. tangeri* and *S. huzardii* and *C. armatum* were resident in this mangrove wetland with *S. huzardii* being the most abundant. The mangrove wetlands should be treated as a protected area and effective monitoring of this ecosystem done for the purpose of conserving it and improving biodiversity.

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