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Aspects of the biology of blue crab *Callinectes amnicola* (DE Rocheburen, 1883) in Lagos lagoon, Nigeria

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Abstract: The length-weight relationship, condition factor and sex ratio of blue crab *Callinectes amnicola* from Lagos Lagoon, Lagos State, Nigeria were studied for a period of one year. Each crab was sorted into species, sex and the required metric measurements were taken. The carapace width and length were measured to the nearest millimetre (mm) while weight was measured to the nearest grams (g). The length-weight relationships of all samples collected were determined for the various sexes. The exponent 'b' values for all the sexes from the 3 stations significantly different ($p<0.001$) ranged from 2.170-2.928. The growth generally exhibited negatively allometry in all the sexes throughout the 3 stations. The condition factor (k) values were significantly different ($p<0.001$) ranged from 5.73-7.53.The "k" values of male crabs were higher than female crabs across the 3 stations. The sex ratios differ significantly from the expected 1:1 ratio; the female blue crabs were more abundance than males in all the stations, which suggests the stations to be breeding ground for crabs.

Key Words: *Callinectes amnicola*, length-weight relationship, condition factor and sex ratio

Introduction

Blue Crab *Callinectes amnicola* are inshore, demersal estuarine crab species. They occupy a variety of estuarine habitats from the lower reaches of freshwater rivers, estuaries and coastal marine waters and are highly mobile, making it possible for them to move between areas and to select habitats (Ryer *et al*, 1997; Micheli and Peterson, 1999). Several studies have been carried out on crabs such as; taxonomy and distribution (Powell, 1983, 1985; Jonathan and Powell, 1989), nutritional composition (Oduro *et al.,* 2001), ecology (Arimoro and idoro, 2007), morphometrics (Akin-oriola *et al.,* 2005); food and feeding (Arimoro and Idoro, 2007); the morphology, abundance, size and sex distribution (Abowei

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and George, 2010), and population characteristics (Udoh and Nlewadim, 2011). This study aimed to provide baseline data on the biology of *C. aminicola* from three different locations in the Lagos Lagoon, an important fishing zone to inhabitant of community and metropolitan Lagos at large with particular emphasis on the length-weight relationship, condition factor and sex ratio for the evaluation of its ecology with a view to effectively manage the resources for sustainable supply to the citizenry.

Materials and Methods

Study Area

Lagos Lagoon complex is the largest lagoon systems of the Gulf of Guinea coast in West Africa; it stretches from Cotonou in the Republic of Benin and extends to the fringes of Niger Delta in Nigeria along its 257km course. The lagoon lies between longitudes 3° 22′ E and 3° 4′ E and Latitude 6° 17′ N and 6° 28′ N. The Lagoon is generally shallow with a depth range between 0.3 and 3.2m with the exception of some dredged parts, notably in the Lagos harbor. Due to increase in industrialization in Lagos State, the population density has increase and these have greater input to the quantity and type of waste generated in Lagos. The Lagoon act as the sink for most of these wastes

Sampling Stations

Three sampling stations were established based on the nature of anthropogenic waste (pollutant) in each station. The sampling stations namely Makoko and Okobaba are on the western side of the Lagoon about 15 kilometers apart from each other, Ajah is on the northern part of the Lagoon. Makoko (station one) receives domestic waste from the settlement on the water and from land. There are fishers folks living in Makoko, likewise there are a lot of fishing activities going on there. In Okobaba (station two) there are many saw-mill situated in this station which generate lot of wood shaft. Also, there are lots of logs of wood floating on the surface of water around this station. Sometimes, waste packed at the shore; serve as a source of organic pollution in the area. Ajah (station three) receives little or no waste as reported by Oyewo (1998) and Adebayo *et al.* (2007) to be free of effluent discharge. This may be because is far from direct anthropogenic waste disposal.

Sample Collection

Callinectes amnicola samples were collected monthly for twelve months (February, 2010 to January, 2011) using the round lift net trap at each of the sampling stations on the lagoon. Fishermen were employed to fish for the crab in all the stations. The catches were taken to the laboratory in a cooler and stored in a deep freezer for further analysis. Crabs were identified to species level using photo cards and available identification keys (Schneider, 1990).

Each crab was sorted into species, sex and

the required metric measurements were taken. The carapace width and length were measured with 0.5mm precision vernier calliper to the nearest millimetre (mm) while weight measurement was done using 0.001g precision Adam (PGW series) weighing balance to the nearest grams (g). The length-weight relationships of all samples collected were determined for the various sexes by the expression:

$W = aL^b$ (Pauly, 1983) (1)

Where:

W = the derived weight (a)

L = the carapace length (mm) or width

a = the intercept of the regression curve

b = the regression coefficient (slope)

The parameters 'a' (intercept) and 'b' (slope) are easily estimated by the linear regression based on Logarithms as

$\text{Log}W = \text{Log}\, a + b \log L$ (2)

The pattern of growth (isometric or allometric) in *C. amnicola* was determined from the value of 'b' in the equation $W = aL^b$.

The Fulton's condition factor (K) was estimated from mean length and mean weight in the sample using the relationship

$$K = \frac{100\ W}{L^3}$$ (Gayanilo *et al.*, 1997) (3)

Where:

K = Condition factor

W = mean weight of crab (g)

L = mean length of crab (mm)

All data on length-weight relationship were subjected to t test analysis at $P<0.001$

Tab. 1: Length-weight relationship of blue crab *C.amnicola* collected from the three stations

Station	Sex	regression equation	a	b	r	c.f	N	Mean L (mm)	Mean Wt (g)
1	Male	$W=1.087L^{2.928}$	1.087	2.928	0.883	7.49	23	10.223	80.033
	Female	$W=0.806L^{2.580}$	0.806	2,580	0.824	5.73	64	11.514	87.473
	Combined Sex	$W=0.697L^{2.493}$	0.697	2.493	0.820	6.13	87	11.173	85.506
2	Male	$W=0.466L^{2.332}$	0.466	2.332	0.852	7.53	33	10.285	81.867
	Female	$W=0.588L^{2.377}$	0.588	2.377	0.903	5.85	63	11.383	86.267
	Combined Sex	$W=0.347L^{2.170}$	0.347	2.170	0.833	6.36	96	11.005	84.754
3	Male	$W=0.917L^{2.767}$	0.917	2.767	0.819	7.31	40	10.296	79.77
	Female	$W=0.543L^{2.330}$	0.543	2.330	0.814	5.78	65	11.388	85.305
	Combined Sex	$W=0.420L^{2.236}$	0.420	2.236	0.758	6.30	105	10.972	83.196

a, b= regression coefficient; r = correlation coefficient; c.f = condition factor; N = number of crabs; L = carapace length; Wt = Weight.

Result

The results of length-weight relationship study using the log-log transformation, linear square regression analysis method, condition factor (k), mean length, mean weight and sex are presented in Table 1. The exponent 'b' values for all the sexes from the three stations significantly ($p<0.001$) ranged from (2.170-2.928). The range of males (2.332-2.928), females (2.330-2.580) and combined sexes (2.170-2.493) respectively (Table 1), the growth generally exhibited negative allometry in all the sexes of the *C. amnicola* from the three stations. The regression equations revealed high correlation in all sexes of the three stations as the correlation coefficient (r) values are close to r =1, station 1(male) has the highest r value while station 3 (combined sexes) has the lowest r value. However, station 2 has the highest mean r value followed by station 1 while station 3 has the lowest mean r value.

The results of the mean "k" for the male, female and combined sexes of blue crab *C. amnicola* collected from the three stations are shown in Table 1. The "k" values significantly different ($p<0.001$) ranged from 5.73-7.53.The "k" values of male crab were higher than female across the 3 stations. The "k" values of the males ranged from 7.31-7.53, female (5.73-5.85) and combined sexes (6.13-6.36) respectively female has the minimum "k" value 5.73 and the highest" k" values were *C. amnicola* collected from the station 2.

The ratios are presented in Table 2. The female crabs are more than male crabs in all the stations and the ratios are differ significantly from the expected 1:1 ratio.

Tab. 2: sex ratio (female:Male) of blue crab *C.amnicola* collected from the three stations

Station	Ratio
1	2.8:1
2	1.9:1
3	1.6:1

Discussion

The observed values of the regression coefficient (b) for the males, females and combined sexes from the 3 stations less than 3 are the indication of negative allometric growth. This is in agreement with the results from Badagry, Lagos and Lekki Lagoons for the same species by (Lawal-Are, 2003).The "b" values obtained in this study also agreed with values obtained for *C. sapidus* from Georgia (Stickney, 1972) and Beymelek Lagoon Lake, Turkey (Atar and Secer, 2003). However, these results are contrary to what was observed in Lagos Lagoon and its adjacent creeks on the same species by Emmanuel, (2008), who reported a positive allometric growth for *C. amnicola*. Akin-Oriola *et al* (2005) also reported b>3 (positive allometric growth) for *Callinectes pallidus* from Ojo Creek

in Badagry, Lagos state which may be due to accumulation of sperm and eggs.

Generally, the regression equation revealed a high correlation in all the sexes across each station since the correlation coefficient (r) values are very close to unity. This observation is indicative of a very positive correlation between carapace length and total weight in this species. This agreed with the report on the same species from Badagry, Lagos and Lekki Lagoons by (Lawal-Are, 2003) and the results on the species from Lagos Lagoon and its adjacent creeks by Emmanuel (2008). The "k" for the *C. amnicola* from the 3 stations ranged from 5.73 – 7.53 falls within 5.67 -9.97 as reported by Lawal-Are and Kusemiju (2000) for the blue crab *C. amnicola* in the adjacent Badagry Lagoon. Male crabs have higher "k" values across the three stations, Lawal-Are and Kusemiju, (2000) reported higher condition factor in male than females crabs in Badagry Lagoon Nigeria. Also while Emmanuel, (2008) observed in his study at Lagos Lagoon and its adjacent creek higher condition factor in the males than the female crabs. He also observed that condition factor was lower in the smaller crabs. In fact, Warner (1977) reported that in blue crabs, the males showed a higher condition factor than the females. The females were significantly more than males across all the stations. This differed from the nearly 1:1 ratio obtained for *C. amnicola* in the Lagos Lagoon by Lawal – are (2010).

In conclusion, the composition of both sexes gave better over-view of length-weight relationship for blue crab *C. amnicola*. The female blue crabs *C. aminicola* were more abundance than males in all the stations, which suggests the stations to be breeding ground for crabs. Lower "k" values in female *C. amnicola* than male *C. amnicola* might be due to reproductive stress. The brackish environment of Lagoon produced *C. amnicola* of lower *b* value, which may be attributed to pollution status or anthropogenic activities that occur in it.

References

- ✓ Abowei J.F.N. and George A.D.I. (2010. The morphology, abundance, size and sex distribution of *Callinectes amnicola* (De Rochebrune, 1883) from Okpoka Creek, Niger Delta, Nigeria. Current. Research Journal of Biological Sciences 2(1): 27-34.
- ✓ Adebayo O.T., Balogun A.M. and Olubiyi O.A.(2007) Chemical Analysis of some Industria; Discharge into Lagos Lagoon, Nigeria.Research journal of Environmental sciences, 1(4): 196-199.
- ✓ Akin-Oriola G., Anetekhai M. and Olowonirejuaro K. (2005) Morphometric and meristic studies in two crabs: *Cardiosoma armatum* and *Callinectes pallidus*. Turkish J Fish Aquat Sci., 5: 85-89.
- ✓ Arimoro F.O. and Idoro B.O. (2007) Ecological studies and biology of *Callinectes amnicola* (Family: Portunidae) in the lower reaches of Warri River, Delta State, Nigeria. World J Zool., 2(2): 57–66.
- ✓ Atar H.H. and S. Secer (2003) Width/LengthRelationships of blue crab (*Callinectes sapidus*, Rathbun, 1896) Population Living in Beymelek Lagoon Lake. Turk. J. Vet. Anim. Sci., 27: 443-447.
- ✓ Emmanuel B.E. (2008) The Fishery and bionomics of the

swimming crab, *Callinectes aminicola* (DeRocheburne, 1883) from a Tropical Lagoon and its adjacent creek, South West, Nigeria. J. Fish. Aquat. Sci., 3(2): 114-125.

- ✓ Enin U.I. (1994) Length-weight parameters and condition factor of two West African prawns. *Rev. Hydrobiol. de Trop.,* 27(2): 121-127.
- ✓ Gayanilo, F.C. Jr. and D. Pauly (1997) FAO-ICLARM Stock Assessment Tools (FISA T). *Reference Manual FAO-Computerized Information Series (Fisheries)* No. 8, Rome, FAO, 262.
- ✓ Jonathan G.E. and Powell C.B. (1989) The crab larvae (Crustacea, Decapoda, Brachyura) of tidal fresh water and low-salinity estuaries in West Africa. Trop Freshwat Biol., 2: 158-168.
- ✓ Lawal-Are, A.O. (2003) Aspects of the Biology of the Lagoon crab, *Callinectes amnicola* (DeRocheburne). In: Badagry, Lagos and Lekki Lagoons, Nigeria. A.A. Eyo and E.A. Ajao, (Eds.). Proceedings of the 16th Annual Conference of the Fisheries Society of Nigeria (FISON), Maiduguri 4-9th November, 2001, 215-220.
- ✓ Lawal-Are A.O. (2010) Reproductive Biology of the Blue Crab, *Callinectes amnicola* (DeRocheburne) 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. J Sci Dev., 4: 117-126.
- ✓ Micheli F. and Peterson C.H. (1999) Estuarine vegetated habitats as corridors for predator movements. Conservation Biol., 13(4): 869-881.
- ✓ Oduro W., Ellis W., Oduro I. and Tetteh D. (2001) Nutritional quality of selected Ghanaian crab species. J Ghana Sci Ass., 3: 37-40.
- ✓ Oyewo E.O. (1998) Industrial sources and distribution of heavy metals in Lagos lagoon and their biological effects on estuarine animals. Ph.D Thesis, University of Lagos, Nigeria.
- ✓ Pauly D. (1983) Length-converted catch curves: A powerful tool for fisheries research in the tropics. Part 1 Fishbyte., 1(2): 9-13.
- ✓ Powell C.B. (1983) Keys to the identification of Nigerian crabs. *Monograph*. University of Port Harcourt, Port Harcourt, Nigeria.
- ✓ Powell C.B. (1985) The decapod crustaceans of the Niger Delta. In: The mangrove ecosystem of the Niger Delta. Proceedings of a workshop, Wilcox B. H. R., Powell, C. B. (eds.), pp. 226 – 238, University of Port Harcourt Press, Port Harcourt, Nigeria.
- ✓ Ryer C.H., van Montfrans J. and Moody K.E. (1997) Cannibalism, refugia and the molting blue crab. Mar Ecol Prog Ser,. 147: 77-85.
- ✓ Schneider W. (1990) FAO species identification sheets for fishery purposes. Field guide to the commercial marine resources of the Gulf of Guinea. Prepared and published with the support of the FAO Regional office for Africa Rome, FAO.
- ✓ Stickney R.R. (1972) Length-Weight relationships for several fishes and invertebrates in Georgia coastal wasters with condition factors for fish species. Skidaway Institute of Oceanography Savannah, Georgia.
- ✓ Udoh J.P and Nlewadim A.A. (2011) Population characteristics of the swimming crab *Callinectes amnicola* De Rocheburne, 1883 (Crustacea, Brachyura, Portunidae) in the Qua Iboe River estuary, Nigeria. AACL Bioflux, 4 (3): 412-422.