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Size composition, Growth pattern and Condition factor of two Portunid crabs, *Callinectes amnicola* (De Rochebrune) and *Portunus validus* (Herklots) from Lagos Coast, Nigeria

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ABSTRACT
A study of the size composition and growth pattern of two economically important portunid crabs *Callinectes amnicola,* and *Portunus validus* from Lagos Coast was conducted from April to September, 2016 using standard morphological techniques. A total of 715 crabs obtained from fishing trawlers were examined. The carapace length for *C. amnicola* ranged from 2.8 cm to 7.4 cm (Caparace width 4.0 to 14.9cm) and total weight from 11.4 g to 232.0 g, while the carapace length of *P. validus* ranged between 4.1cm and 10.9cm (Carapace width 8.0cm to 18.0cm) and weight 70.0g to 616.0g. Both portunid crabs exhibited negative allometric growth as shown by the mean exponents 'b'=2.271 for *C. amnicola* and 'b'=2.676 for *P. validus*. There was high correlation (r almost =1) between carapace width and body weight of the crabs with a coefficient (r) ranging between 0.931 and 0.951 for *C. amnicola* and between 0.887 and 0.921 for *P. validus*. Condition factor ranged between 4.27 and 5.58 (mean 5.23) in *C. amnicola* and between 4.56 and 22.82 (mean 9.56) in *P. validus*. The condition factor decreased with increase in size of *P. validus* but slightly increased with increase in size of *C. amnicola*. The fairly higher biometric dimensions showed by both portunid species implies that the station is environmentally dynamic.

Key words: Portunid crab, size composition, length-weight, growth pattern, condition factor, Lagos

INTRODUCTION

The portunids*,* *Callinectes* species *and Portunus* species belonging to the family Portunidae are decapod crustaceans of high economic importance world-wide and have been subjected to intense aquaculture practices especially in Asia and the Americas. World fisheries for portunid crabs are dominated by three species, *Portunus trituberculatus* (Japanese "gazami") (50%), *P. pelagicus* ("blue swimming crab") (25%) and *Callinectes sapidus* ("blue crab") (25%) (Secor *et al*., 2002).

Portunid crabs are the most economically abundant estuarine macro invertebrates that support valuable commercial and recreational fisheries along the Atlantic and Gulf coasts (Guillory and Perret, 1998). These crabs inhabit a variety of aquatic habitats from the lower reaches of freshwater rivers, estuaries to coastal marine waters and are highly mobile, making it feasible for them to move between areas and to select habitats (Lawson and Oloko, 2013). In Nigeria, two species of these portunid crabs, *Callinectes amnicola,* and *Portunus validus* are important food items and are good items for exports when fully recruited for aquaculture. The lagoon crab *Callinectes amnicola* is caught in the creeks, lagoons and the adjacent inshore marine waters while smooth swim, crab *Portunus validus* is caught in beach seines, trawl nets and fish pots off Nigeria coastal waters.

While portunid crab farming is well developed in Asia-Pacific region (FAO, 2011), proposals are just now on hand to culture them in the West African region (Nigeria inclusive). Until adequate hatchery systems are developed for production of their seeds, the young crabs may still have to be sourced from the wild. With the heavy population of *Callinectes amnicola*, and *Portunus validus* in lagoons and off coast, this will constitute ready sources of these crabs in Southern Nigeria. Despite its economic importance and future potentials very little documented works are available on these portunid crabs in Nigeria. Aspects of the biology of the *Callinectes* specie occurring in Nigeria have been documented

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by Lawal-Are and Kusemiju (2000) on size composition, growth pattern and feeding habits from Badagry Lagoon, Olakolu and Fakayode (2014) on some aspects of its biology in Lagos Lagoon, Lawson and Oloko (2013) on growth pattern in Yewa River, Udoh and Nlewadim (2011) on population characteristics in Qua Iboe River estuary, Abowei and George (2009) on the condition factor from Okpoka Creek in Niger Delta and Emmanuel (2008) on the fishery and bionomics in a tropical Lagoon, Southwest. However, the dearth of comparative work on these species has prompted this study. This study, therefore, aimed at investigating the morphometric parameters, growth pattern, and condition factor of *Callinectes amnicola*, and *Portunus validus* from Lagos Coast, with a view to effectively manage the resources for sustainable fisheries.

MATERIALS AND METHODS

Samples of the portunid crabs were obtained from fishing trawlers operating around the Lagos Coast as by-catch. The sampling site is geographically located at latitude of 6° 24' North and longitude of 3° 23' East (Ajao and Fagade, 1990) as shown in Fig.1.

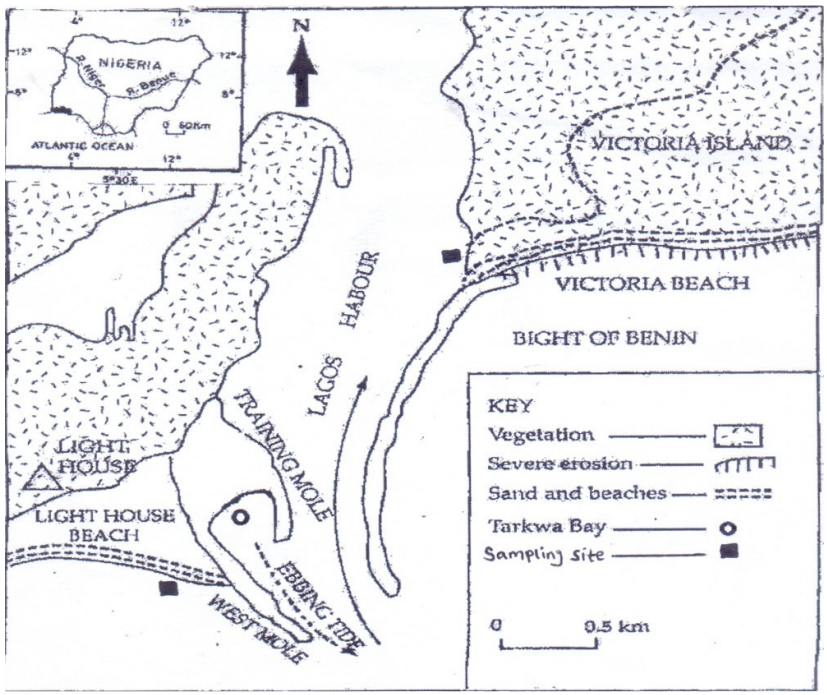

Fig. 1: Map of Lagos Coast showing the sampling sites

Specimens were obtained from the trawlers during their landings at Ijora and Apapa fishing terminals between April and September 2016. The specimens were immediately preserved in an ice-chest with ice-blocks and later transferred into a deep freezer in the laboratory prior to study. Seven hundred and fifteen (715) specimens made up of 406 *Callinectes amnicola* and 309 *Portunus validus* were examined in this study.

The crabs were removed from the freezer and allowed to thaw. Excess water was removed from the specimens using filter paper. The carapace length of the crab was measured to the nearest centimetre from the edge of the frontal region to the tip of the carapace back wall (Fig. 2) using a venire calliper. The carapace width was taken from the tip of the left dorsal spine to the tip of the right dorsal spine.

The total weight of the crab was taken on a Sartorius top loading balance (Model 1106) to the nearest tenth of a gram. The carapace-length/weight relationship was expressed by Log W = Log a + b Log L

(Parsons, 1988).Where W = weight of the crab in g, L = carapace length in cm, a = regression constant and b = regression coefficient. The condition factor which is the general well-being of a crab was studied in relationship to size. The equation goes thus: $K=100W/L^b$ (Gayanilo and Pauly, 1997). Where K=condition factor, W=weight of the crab (g) and L=length of the crab (cm).

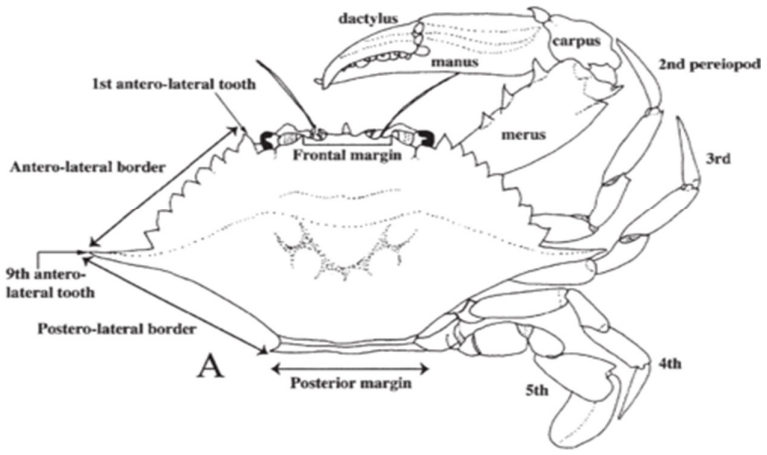

Fig. 2: External Morphology of a Portunid Crab

RESULTS

Size composition

Highest number of samples for both *Callinectes amnicola* (29.8%) and *Portunus validus* (23.3%) were obtained in April while lowest number was recorded for *Callinectes amnicola* (9.4%) in July and August for *Portunus validus* (12.3%) as shown in Table 1.

Table 1**:** Monthly collection of the Portunid crabs from Lagos coast (April-Sept., 2016)

Months	**Portunid crabs**			
	Callinectes amnicola	**Percentage (%)**	***Portunus validus***	**Percentage %**
April	121	29.8	72	23.3
May	89	21.9	60	19.4
June	40	9.9	52	16.8
July	38	9.4	45	14.6
August	57	14.0	38	12.3
September	61	15.0	42	13.6
Total	406		309	

In the carapace length frequency distribution of the crabs, size group 3.8 – 4.0cm was most abundant for *Callinectes amnicola* (Fig. 3) while 5.9 – 8.0cm of *Portunus validus* (Fig. 4) was the most abundant size group.

Growth pattern

Growth pattern for the crabs was based on the Length/weight Relationship. *Callinectes amnicola* ranged in carapace length from 2.8 cm to 7.4 cm (Caparace width 4.0 to 14.9cm) and total weight from 11.4 g to 232.0 g, while the carapace length of *Portunus validus* ranged between 4.1cm and 10.9cm (Carapace width 8.0cm to 18.0cm) and weight 70.0g to 616.0g as illustrated by the Log length/Log weight relationships (Fig. 3 – 8).

Figures (3-10) showed high correlation (r almost =1) between carapace width and body weight of the crabs with correlation coefficient (r) ranging between 0.931 and 0.951 for *C. amnicola* and between 0.887 and 0.921 for *P. validus*. Both portunid crabs exhibited negative allometric growth as shown by the mean exponents (combined sex) 'b'=2.271 for *C. amnicola* and 'b'=2.676 for *P. validus*. The calculated log of the length/weight relationship of the portunid crabs showed a linear relationship between the length and weight of the crabs.

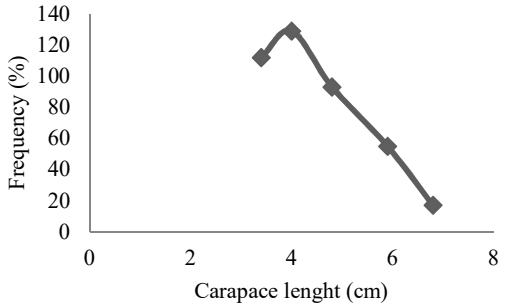

Fig. 3: Carapace length frequency distribution of *Callinectes amnicola* from Lagos Coast April to Sept., 2016)

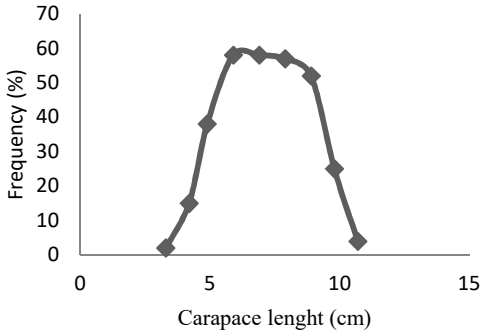

Fig. 4: Carapace length frequency distribution of *Portunus validus* from Lagos Coast (April to Sept., 2016).

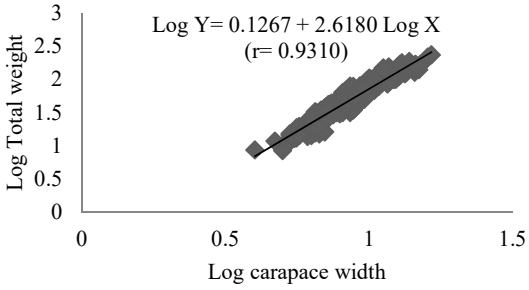

Fig. 5: Log carapace length /Log weight relationship of male *C.amnicola*

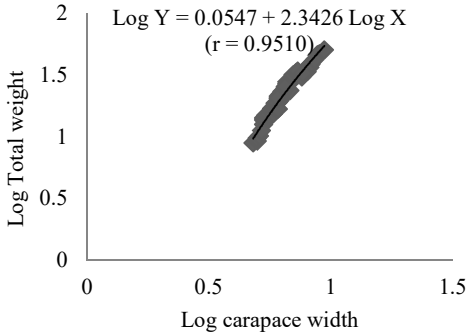

Fig. 6: Log carapace length /Log weight relationship of female *C. amnicola*

Condition factor ranged between 4.27 and 5.58 (mean 5.23) in *C. amnicola* and between 4.56 and 22.82 (mean 9.56) in *P. validus* as shown in Table 2. The condition factor decreased with increase in size of *P. validus* but slightly increased with increase in size of *C. amnicola*.

The relationship between log carapace length and log weight measurements of *C. amnicola* and *P. validus* from Lagos Coast are presented in the regression equations shown below:

Callinectes amnicola

Male:	Log Y = 0.1267 + 2.6180 Log X	(r = 0.9310)
Female:	Log Y = 0.0547 + 2.3426 Log X	(r = 0.9510)
Combined sexes:	Log Y = 0.1124 + 2.2712 Log X	(r = 0.9320)

Portunus validus

Male:	Log Y= - 0.6190+ 2.6122 Log X	(r = 0.9211)
Female:	Log Y = - 1.1475 + 3.0353 Log X	(r = 0.8870)
Combined sexes:	Log Y = - 0.9240 + 2.6757 Log X	(r = 0.8907)

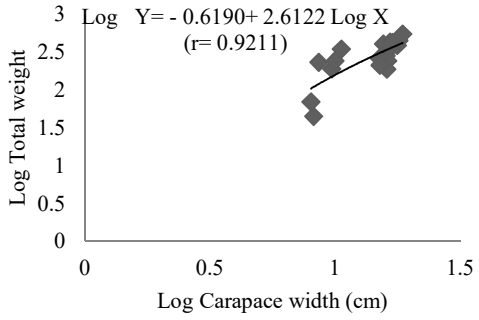

Fig. 7: Log carapace length /Log weight relationship of male *P.validus*

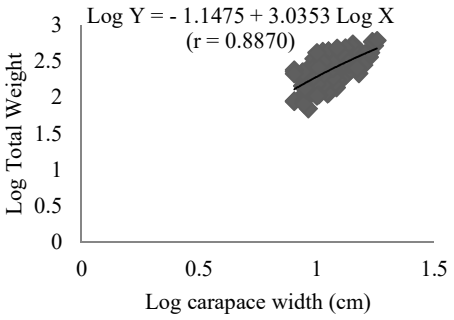

Fig. 8: Log carapace length /Log weight relationship of female *P.validus*

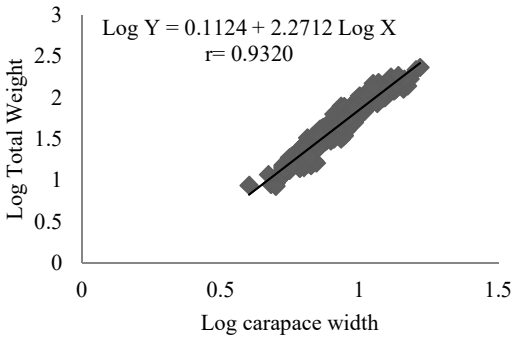

Fig. 9: Log carapace length /Log weight relationship of combined sexes *C.amnicola* from Lagos Coast

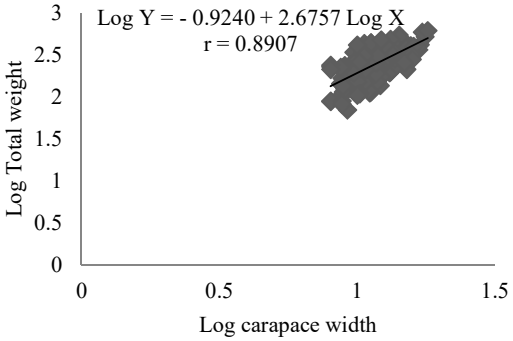

Fig. 10: Log carapace length /Log weight relationship of combined sex *P. validus* from Lagos Coast.

Table 2: Condition factors (K) for *C. amnicola* and *P. validus* from Lagos Coast. (April to Sept. 2016)

CL (cm)	*Callinectes amnicola*				*Portunus validus*			
	N	CL (cm)	WT (g)	K	N	CL (cm)	WT (g)	K
2.5 -3.4	112	3.4	16.8	4.27	2	3.3	82.0	22.82
3.5-4.4	129	4.0	35.4	5.53	15	4.2	79.3	10.70
4.5-5.4	93	4.8	61.7	5.58	38	4.9	147.1	12.50
5.5-6.4	55	5.9	114.7	5.58	58	5.9	233.2	11.35
6.5-7.4	17	6.8	163.5	5.20	58	6.9	281.9	8.58
7.5-8.4	-	-	-	-	57	7.9	292.2	5.93
8.5-9.4	-	-	-	-	52	8.9	340.8	4.83
9.5-10.4	-	-	-	-	25	9.8	447.2	4.75
10.5-11.4	-	-	-	-	4	10.7	559	4.56
Mean	406	5.23			309			9.56

Key: N= Number of Crabs, CL= Carapace length (cm), WT= Crab weight (g), K= Condition factor.

DISCUSSION

This study on the size composition and growth pattern of *Callinectes amnicola* and *Portunus validus* from Lagos Coast revealed a unimodal distribution for both species. Similar study has been reported by Lawal-Are (2003) on Lagoon crab, *C. amnicola* from Badagry lagoon in Lagos. Also, the observed values of the regression coefficient (b) for *C.amnicola* (male = 2.613, female = 2.343 and combined

sexes = 2.271) less than 3 are indication of negative allometric growth. This is parallel with the studies of Abowei and George (2009) on the same species from Okpoka Creek in Niger Delta. *Portunus validus* also shows negative allometric except in female sex with b= 3.035 making the allometry to be positive. This is supported by Akin-Oriola *et al.* (2005) who reported b>3 (positive allometric growth) for *Callinectes pallidus* from Ojo Creek in Badagry, Lagos state. Similar trend was also observed on portunid specie from Lagos lagoon and adjacent creeks by Emmanuel (2008).

However, the regression lines revealed a high correlation in all the sexes of both species since the correlation coefficient (r) values are very close to unity. This observation is indicative of a strong uphill linear relationship between carapace length and total weight in both species. This agreed with the report on the same species from Badagry, Lagos and Lekki Lagoons by Lawal-Are (2003) and that of Emmanuel (2008) from Lagos Lagoon and its adjacent creeks.

In studies of population dynamics, high "k" values of a crab show favorable environmental conditions such as habitat and prey availability. This assertion shows relevance to this research work as the mean condition factor for *P. validus* (9.56) is higher than that of *C.amnicola* (5.23) from Lagos Coast. Similar results were documented for *C. amnicola* by Lawal-Are and Kusemiju (2000).

Conclusively, the abundance and length-weight relationship of both crabs gave better insight to size composition and growth pattern for the portunid crabs *C. amnicola and P. validus*. The portunid crab *C. aminicola* were more abundance than *P. validus* in all the stations, which suggests that the latter is more of marine inhabitant. The "k" values changes with increasing carapace length and weight. Therefore, condition factor in portunid crabs might be based on the hypothesis that heavier individuals of a given length are in better condition than less weighty ones.

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