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Length-Weight Relationship and Condition Factor of the West African Fiddler Crab (*Ucatangeri*) in MboRiver, AkwaIbom State, Nigeria

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Abstract
The length- weight relationship and condition factor of the West African fiddler crab (*Ucatangeri*) in Mbo river of AkwaIbom State, Nigeria, was conducted for 12 consecutive months (April, 2012 – March, 2013). *Ucatangeri* exhibits sexual dimorphism with sex ratio of 1.2:1.0 which was significantly biased in favour of males. The length-weight relationship showed negative allometric growth, b=1.6431. With an average of 9.61, *Ucatangeri* had a very high condition factor which is an indication of the well-being of the species.
Keywords: Growth rate, Crab, Mbo.

1.0 Introduction

Crabs, together with other macro-benthic invertebrates, constitute the link between the unavailable nutrients in detritus and useful protein materials in fish and shellfish. Most benthic organisms feed on debris that settle on the bottom of the water and in turn serve as food for a wide range of fishes(Adebisi, 1989; Ajao and Fagade ,1990; Oke, 1990; Idowu and Ugwumba, 2005). They also accelerate the breakdown of decaying organic matter into simpler inorganic forms such as phosphates and nitrates (Gallep et. al., 1978). All forms of aquatic plants, which are the first link of several food chains existing in aquatic environment, can utilize the nutrients. These organisms therefore form a major link in the food chain as most fishes, birds and mammals depend directly or indirectly on them for their food supply (Barnes and Hughes, 1988).

The West African fiddler crab (*Ucatangeri*) is a species of fiddler crab that lives in the eastern Atlantic Ocean. It is the largest species in the genus Uca, with a carapace up to 50 millimetres (2.0 in) wide, and up to 25 mm (1.0 in) long. The males have one claw much larger than the other, which they use for communication. The carapace is violet to black, or sometimes yellowish in females, while the appendages are yellowish brown. The range of Ucatangeri extends from southern Portugal southwards to Angola; it is the most abundant crab in the Gambia (Hartnoll 1988).

Length-weight relationship is regarded as more suitable for assessing not only fish, but also crustacean (Sukumaran&Neelakantan, 1997; Tabash, 2001). The relationships between carapace length and weight of the crabs have many uses. They are often used to calculate the standing stock biomass, condition indices, analysis of ontogenetic changes and several other aspects of crustacean population dynamics (Atar&Seçer, 2003). In addition they are used for the management of population. According to Lagler (1968), the relationship can be used to estimate the recovery of edible meat from crabs of various sizes. Body weight, total length and carapace length are the most frequently used dimensions in the study of crustaceans (Sukumaran&Neelakantan, 1997).

The earliest published estimate of crab population densities was that of Turnbull-Kemp (1960), who calculated the density of Potamonautesperlatus individuals greater than 17 mm CW at Inyanga (Zimbabwe) as 0.8–1.3 m-2, with a combined wet weight of 5.5–13.6 g m-2. This is low in comparison with an estimated density of the same species in the Buffalo River (Cape Province, South Africa) at 1.7–5.2 crabs m-2 (based only on specimens >25 mm CW) and a (dry) biomass of 54–136 g m-2 (Hill & O'Keefe 1992).In the work of Bello-Olusoji, et. al., (2009),there was a strong relationship (r2 = 0.81) between length and weight of males and females and the entire crab population. The LWR was allometric for all crabs. Results also showed that there was a weak correlation (r2 = 0.36) between fecundity and total body weight of the crabs. The length-weight distribution pattern did not show remarkable differences between species, sexes, and populations.Abowei and George (2009) examined the length - weight relationship and condition factor of Callinectesamnicola from Okpoka Creek in the Niger Delta area of Nigeria for a period of one year. Growth generally exhibited a negative allometry in all the sexes. Generally, the regression equations revealed high correlation in all the sexes. The monthly K values of the males ranged from 0.0984 and 0.1503 (mean = 0.1214). The estimated K value for both sexes combined was 0.1260. Similarly, estimated K values for the females ranged from 0.0889 – 0.1524.The overall mean K value for the females was 0.1229. The minimum K value (0.0984) for the males was observed in February. The female C. amnicola minimum K value (0.0889) and Kmax (0.1580) values were obtained in November.

2.0 Materials and Method

2.1 **The Study Area:** Mbo River (Fig. 1) is a tributary of the Cross River. It lies between longitude 8º:00¹ – 8º:30¹E and latitude 4º:30¹-4º:45¹N, and falls within the tropical rainforest belt with equatorial climate regime. The location of the study area is just north of the Equator and within the humid tropics and its proximity to the sea makes the area generally humid. The crabs were collected with the assistance of fishers using artisanal baited pots, traps and hands (manual) to pick and dislodge them from their nest. They were placed in clean polythene bags and taken to the laboratory for analysis.

2.2 **Determination of Length-Weight and Condition Factor:** The total body weight (BW) of the crab was measured to the nearest 0.1 g using a
weighing balance (HANNA), while the carapace length (CL) was measured with a laboratory measuring board to the nearest 0.1 cm. The length-weight relationship was estimated using the equation:

$W = aL^b$

where W is the weight, *a* is the intercept, L is carapace length and *b* is the slope. The value of *a* and *b* were computed from the log transformed values of length and weight,
i.e.

Log W = log a + b Log L,

where W = weight (g) of the crabs, L = horizontal carapace length (using the linear regression routine of Microsoft Office Excel in PC windows (2003). The parameters *a* (intercept) and *b* (slope) were estimated by linear regression based on logarithms;
log(W) = log (a) + b log (L). The significance of regression was assessed by analysis of variance (ANOVA). Equations expressing the length-weight relationships of *Ucatangeri*were calculated in relation to sex. For testing possible significant ($P > 0.01$) differences between the sexes Student's test was used for comparison of the two slopes. FORTRAN program Mature II computer technique was used to estimate the size at sexual maturity.
The Fulton's condition factor (cf) was calculated according to Bagenal (1978) with the formula;

$K = 100W/L^{-3}$.

where K is the condition factor (cf), W is the total body weight (BW), L is the carapace length (CL) and 3 is a constant.

3.0 Results and Discussion

The length-weight relationship of *Ucatangeri* in Mbo river showed negative allometric growth, b=1.6431(fig. 2). The variation between the carapace length and the mean weight was statistically highly significant ($p<0.05$).
The growth coefficient (b) values have some implications and significant impacts on the well-being of fishes (including shell fish) and fishery. The negative allometric growth ($b<3$) means the crabs were lighter than their body weights. Fish with high b ($b>3$) values are heavy for their lengths, while those with low b are lighter (Wootton, 1998). Positive allometric growth is an indication of a crab's heaviness and by implication the crabs are heavier than their lengths. The change of *b* values depends primarily on the shape and fatness of the species, seasons or time of the years, temperature, salinity, food (quantity, quality and size), sex and stage of maturity (Sparre, 1992). The parameter *b*, unlike the parameter *a*, may vary seasonally, and even daily, and between habitats. The observed values of the regression coefficient(b) for*Ucatangeri*showed negative allometric growth, b=1.6431 which is less than 3. This is in agreement with the work of Abowei and George(2009). However, these results are contrary to what was observed by Akin-Oriola*et. al.,* (2005) who reported b>3 (positive allometric growth) for *Callinectespallidus*from Ojo Creek in Badagry, Lagos State.
The monthly variation in condition factor of *Ucatangeri* is shown in Table 1. The condition factor was nearly uniform between August 2012 and March 2013, and higher in the month of July 2012. The values of the condition factor ranged between 8.43 and 10.79 with a mean of 9.61 for combined sexes. This high condition factor indicates the well-being of the species.
The correlation factor (r) showed that carapace length is positively correlated with the weight of the species. Available literature lack information on correlation factor (r). Length –Weight relationship of*Ucatangeri*showed allometric growth rate of the species in Mboriver.
Like growth coefficients, condition factor (K) has impacts on the well-being of some aquatic organisms. It varies from species to species, and changes according to morphology, sex, age, reproductive state associated with gonadic maturity stages variations (Frederick & Thomas, 1987; Wootton, 1999). Variations in K may also be indicative of food abundance, adaptation to environment and gonadal development of fish (King, 1995). Low K means the fish are light for their lengths, an indication of low feeding intensity and spawning activity. High K value is an assumption of high feeding intensity and gradual increase in accumulated fat that also suggests preparation for a new reproductive period (Braga and Gennari-Filho, 1990). With an average of 9.61, *Ucatangeri* had a very high condition factor which is an indication of the well-being of the species. This is in agreement with reports of Lawson and Oloko (2013) as well as that of Arimoro and Idoro(2007).

4.0 Conclusion

The length-weight relationship and condition factor are comparable to works done by earlier researchers in other water bodies, implying that Mbo River was suitable for commercial crab production.A 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.

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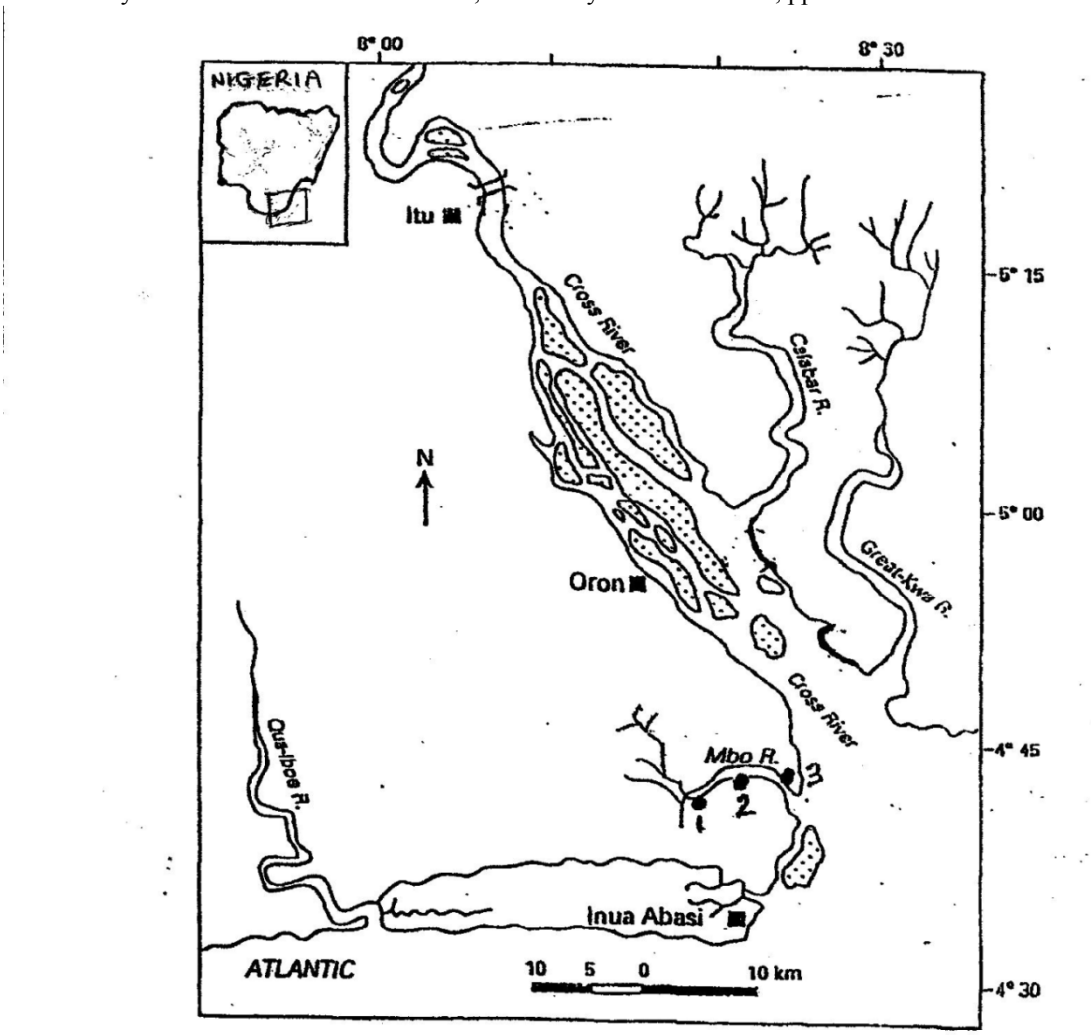

Fig. 1: Map of Mbo River showing the proposed sampling station

(Insert: Map of Nigeria showing the location of the study area)

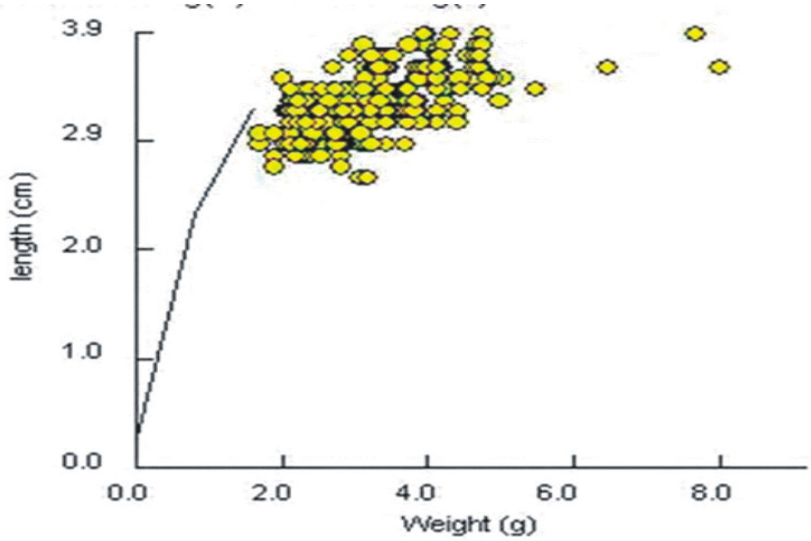

Fig. 2: Length-Weight Relationship of *Ucatangeri*in Mbo River

Table 1 : Monthly Variation in Condition Factor of *Ucatangeri*in Mbo River

Month	Mean Weight(g)	Mean length(cm)	Condition factor (K)
April 2012	2.6153	3.0633	9.0982
May 2012	3.4336	3.3733	8.9451
June 2012	3.0657	3.1867	9.4734
July 2012	3.5593	3.2067	10.7942
August 2012	2.9117	3.2500	8.4819
September 2012	2.9297	3.2117	8.5344
October 2012	2.9370	3.2300	8.7156
November 2012	2.8580	3.2367	8.4286
December 2012	3.0203	3.2667	8.6641
January 2013	3.1550	3.2800	8.9408
February 2013	3.1328	3.2767	8.9048
March 2013	3.2473	3.3333	8.7679

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