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Experimentation on the river crab (*Potamonaute Ebiaensis)* aquaculture in Ebonyi State, Nigeria: preliminary assessment

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Abstract
An investigation was carried out on river crab (*Potamonaute ebiaensis)* to determine prospects and potential constraints for possible trial in aquaculture. Two treatments consisting of male and female were established and replicated 5 times. The specimens weighed 37g to 81.5g and 37g to 47g respectively. The width of their carapace ranged from 3.5cm m to 4.5c and 3.5cm to 3.9cmrespectively. Formulated catfish feed with 42% crude protein was fed at 0.5% to 1.2% body weight. Small crabs responded quicker to feeding than the bigger ones. Casualties were recorded, first within 24 hours until 2 weeks after stocking. Relative survival impact of the males (mean 72.4) was higher than those of the females (mean 46.2). There was a poor relationship between weights and survival. The coefficient of the determination (r^2) for the female and male were 0.03 and 0.1 respectively. Subsequent investigations might consider other methods of handling specimens, growth performance of the crab species and feed formulation.

Keywords: River crab, aquaculture, preliminary, experiment, Ebonyi state, Nigeria

1. Introduction
Sizeable population of *Potamonaute ebiaensis* was observed along Ebie stream at Ohatekwe Izzi in Ebonyi State. They are dark in colouration when compared with the reddish Ebonyi mud crab (*Potamon ebonyicum).* They are generally greenish with white abdomen in both male and female. Greenish colour must have evolved over time as adaptive characteristic of the aquatic environment. Left and right parts of the mouth (beyond the frontal margin) are rough, compared to the smooth ones in *P. ebonyicum.* The shape of abdominal flaps change at various stages, in the same way as that of *P. ebonyicum,* and become rounded at maturity. Habitat of *P. ebonyicum* (semi terrestrial crab) extends from distant moist environment down to the edge of the stream (Pers. obs.). *Potamonaute ebiaensis* can be found beyond this environment, even among aquatic vegetation and debris. By avoiding high-current environment they are able to inhabit flowing water (*Pers. obs.)*. Local fishing gear, baited with small frog or grasshopper can be used to catch crab (Akpaniteaku, 2013) [1]. Two or more crabs can be attracted to the gear depending on the size of the population, availability of food and size of the bait. The crab species can be found along the tributaries of the river (Pers. obs.). Cultivability of the *P. ebonyicum* (mud crab) has been investigated in the basin (Akpaniteaku, 2013) [1]. Catching of free crab from the wild for aquaculture may increase in the future, and efforts to enhance stock quality in captivity through research should be encouraged (Azra *et al*. 2015) [2]. There was a compelling need to evaluate the capacity of *Potamonaute ebiaensis* (river crab) to thrive in captivity. The outcome would help to identify constraints and potential prospects for further investigation on the crab species. The study was therefore aimed at evaluating experimental constraints and aquaculture potentials of the river crab in intensive culture system.

2. Materials and methods
The study was carried out for six (6) weeks. Crab specimens used for the experiments were obtained from Ebia stream – one of the tributaries of Ebonyi River. The stream flowed through Ohatekwe village in Izzi into the river. The crabs were caught with local fishing gear baited with grasshopper. Specimens were transported in jute bags to safe and cooler area,

Where they were carefully tied with local rope, to prevent them from struggling during transportation. They were transported to the research laboratory in plastic buckets. Randomly selected specimens were used for the experiment. Calibrated plastic containers (7 litre volume) each with depth of 21cm were randomly selected for the treatment. Complete randomized block design was adopted for the experiment. The containers were filled with rainwater to the depth of 10cm. Acclimatization of the specimens was carried out for 24 hours before treatment.

Two treatments were established, and replicated 5 times:
Treatment A – Female
Treatment B – Male
The treatments composed of female and male with various weights ranging from 37g to 47g and 37g to 81.5g. Carapace width ranged from 3.9cm to 3.5cm and 4.5cm to 3.5cm respectively. Each treatment contained a crab, which was acclimatized for another 12 hours before sustenance feeding. Formulated complete dry catfish feed (multi feed) imported from Israel (Tables 1 and 2) was used as the sustenance feed at 0.5 to 1.2% body weight.

Table 1: Source of Nutrient

Nutrient	Ingredient
Protein	Fish meal, poultry meal, soy bean, DI-methionine
Carbohydrate	Wheat flour, corn gluten meal, wheat gluten
Oil	Fish oil
Vitamin and Mineral	Choline chloride, stay-C vitamin premix

Source: Multi-feed – Jordan Valley, Israel (Undated)

Table 2: Nutrient Analysis of the Feed

Nutrient	Percentage/Quantity
Protein	42%
Fat	12%
Calcium	2.3%
Phosphorus	1.3%
Manganese	55ppm
Vitamin:	
A	1200 ıμ/kg
E	160 mg/kg
C	120 mg/kg

Source: Multi-feed – Jordan Valley, Israel (Undated)

They were fed once a day from 6 – 7 pm. Captivity assessment was done during the experiments. Relative effects of the culture system was also analysed using the formula:

$$RSI = \frac{SP}{EP} \times 100$$

Where RSI is the relative impact of the culture system on survival of the crabs, SP is the period of survival during the experiment and EP is the period of the experiment. Analysis of correlation coefficient was performed to determine the relationship between weight of crabs and survival rate.

3. Results

Female crab was the first to respond to feeding. It responded 2 hours after dropping of the feed. It took other females and all the males about 48 hours to accept the fish feed. Light crabs (weight range: 37g to 47g) responded quicker than the heavy ones – weight range 54g to 81.5g. Light female and male crabs consumed more feed than the heavy ones. They (light-weight crabs) made some efforts to pick extra pellet during the investigation. None of the additional pellets was fully consumed. The crabs did not make efforts to escape from captivity. They rather floated upright at night, extending their chelae out of the water gasping for air. Survival rate of the crab species during the experiments is presented in Table 3.

Table 3: Survival Rate of the River Crab (Potamonaute ebiaensis) in Captivity after 6 Weeks

Experimental Period (Days)	R1				R2				R3				R4				R5			
	M		F		M		F		M		F		M		F		M		F	
	%	ND	%	ND	%	ND	%	ND	%	ND	%	ND	%	ND	%	ND	%	ND	%	ND
1 – 14	100	–	100	14	100	–	–	1	–	6	100	–	100	–	100	8	100	–	100	–
15 – 28	100	–	–	–	100	–	–	–	–		100	–	100	28	–	–	100	–	100	24
29 – 42	100	42	–	–	–	34	–	–	–		–	30	–	–	–	–	100	42	–	–

R – Replicate; M-Male; F – Female; ND – Number of days Survived; % - Percentage Survival

More female casualties than the males were recorded within 2 weeks after stocking. The first casualty (Female) was recorded 24 hours after stocking. The male casualty was recorded after 2 weeks. More males survived at the end of the experiments than the females. A relative effect of the culture system on the female and male river crabs is shown in Fig 1.

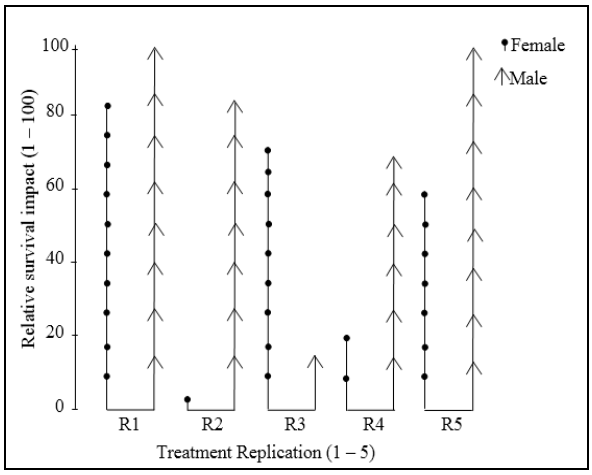

Fig 1: Effect of the Culture System on Survival of Potamonaute ebiaensis for a period of 6 weeks

The relative survival impact (100) of the male was quite significant (P<0.05). The RS1 for replicates 1 and 5 was excellent, and treatment average was 72.4. In the females, RS1 was not as high as in the males. Although very good in replicates 1 and 3, the treatment average was 46.2. The least RS1 (2.4) was recorded by a female crab. Relationships between survival rate and weights of both female and male crabs are shown in Fig 2.

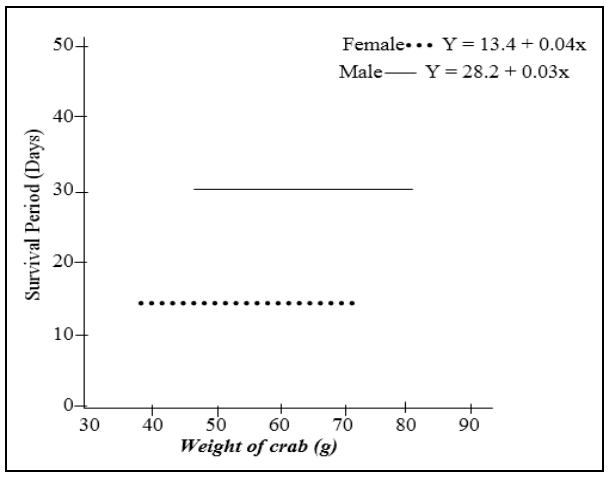

Fig 2: Relationship between weight and survival of Male and female Potamonaute ebiaensis held in captivity for 6 weeks

There was no relationship between weights of the river crab and survival in captivity. The coefficients (r^2) for the female and male were 0.03 and 0.1 respectively.

4. Discussions

Early response to formulated feed may be attributed to nutritional requirement and inherent growth capacity within size range (37g – 47g) of the small female crabs. Positive response of mud crab species to formulated feed has been reported (Akpaniteaku, 2013) [1]. The formulated catfish feed from Israel is relished by the local crabs probably indicating that *Potamonaute ebiaensis* is a universal specimen for experimental aquaculture. Akpaniteaku (2013) [1] reported that *P. ebonyicum* could be reared with catfish feed from Vietnam. The reports may seen to confirm that completely formulated fish feed from any parts of the globe is suitable for crab aquaculture. *Potamonaute ebiaensis* (river crab) did not pick feed as fast as *Potamon ebonyicum* (mudcrab) (Akpaniteaku, 2013 and Pers. obs.) [1]. Perhaps the river crab was either uncomfortable with the culture system or more timid in captivity than the mud crab. The river crab may probably take some time to familiarize themselves with the feed. Methods of controlling movement before and during transportation may have adversely affected river crab during the investigation. Akpaniteaku (2015a) [3] reported that mud crabs could be collected and handled in a manner that would enhance the culture system. Any methods could also be developed in a manner that would utilize relevant reproductive behaviours to enhance crab aquaculture (Akpaniteaku, 2015a) [3].

The female crabs used in the present investigation were yet to show such signs of maturity (Pers. obs.) as the heavily pigmented, abdominal flap of matured females (Fisheries Fact Sheet, 2013) [4]. Neither the females nor the males attempted to escape from captivity (Pers. obs.) in contrary to earlier observation on mud crabs (Akpaniteaku, 2013) [1]. Reasons for not attempting to escape may probably be attributed to inherent adaptive capacity for the aquatic environment. Survival rate of the river crabs (Table 3) seems to be lower than that of the mud crab. Akpaniteaku (2013) [1] reported 33.3% mortality in the latter. The mortality rate was relatively higher in the former than the latter, probably because of residual effects of handling or the muddy nature of their habitats. Survival of more males than the females (Table 3) may seem to suggest that male river crabs are hardier than their female counter-part. The relative effects of hardiness may have been expressed elsewhere in the wild population. Akpaniteaku (2014) [5] reported that percentage abundance of the mud crab in different locations followed a definite pattern, with the males recording significantly higher population than the females. Mode of transportation and methods of handling may seem to be responsible for the mortality. Perhaps mud and river crabs have no distinctive aquaculture potentials. Marginal boundary between habitats may be observed during the rains, and Collins (1990) [6] reported such continuum of territoriality among the crabs as most land adapted ones still return to water to release their eggs. Akpaniteaku (1994) [7] reported that aquatic species may survive in captivity with the aid of such accessories as air stone air pump and filter. Mud crabs are hardy organisms, and not so much is known of disease problems in both juvenile and grow-out phases (SPC, 2011) [8]. Sudden change in their behaviour was observed in previous assessments with aerator and air stone, probably indicating sudden significant increment in dissolved oxygen (Akpaniteaku, 2015b) [9].

5. Conclusion

The preliminary investigation on river crab was conducted to determine experimental potentials of the aquaculture system. The crabs were naturally endowed with the capacity to inhabit aquatic environment. They did not struggle to escape from captivity like the mud crab. Small river crabs responded quicker to feeding than the big ones. Tying of the legs should be avoided during collection of specimens to prevent injury and loss of appendage. The crabs should not be allowed to fall on hard surface to prevent internal injury. Sustaining the life of river crab on formulated catfish feed for six weeks, could be a window for further experimentation on integrated farming. Stocking of carefully handled specimens might give better results in subsequent experiments.

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