

Biology of two freshwater prawns (*Palaeomonetes africanus* and *Demoscaris bislineata*) from the MU River, Makurdi – Benue State, Nigeria

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1 SUMMARY

Length – weight parameters (a and b) of the equation $W=aL^b$ of the Length – Weight Relationship (LWR) were estimated for two freshwater prawns *Palaeomonetes africanus* and *Demoscaris bislineata* caught bimonthly using brush traps in the MU River, Fiidi – Makurdi. The mean b values (exponent of the equation) were estimated as 2.1942 ± 0.2198 and 1.7962 ± 0.2283 for *P. africanus* and *D. bislineata*, respectively. The values of b for these species are less than 3, showing that their growth was negative allometry. The condition factors for these species were 1.72 ± 0.093 for *P. africanus* and 1.67 ± 0.091 for *D. bislineata*. This suggests that *P. africanus* is in a better condition than *D. bislineata* given their respective weights and lengths. The most likely candidate for culture is *P. africanus* which has a higher b value and was in better condition as reported.

2 INTRODUCTION

There are large varieties of prawns and shrimps inhabiting the water bodies of Nigeria. The most common prawn species found in Nigerian rivers are the *Macrobrachium* species (Holthuis, 1980). Freshwater prawns abound in the Benue River system. The condition and length-weight parameters of aquatic species are relevant to understanding their growth and wellbeing (Pauly, 1993). Information on the length - weight relationship of freshwater prawns is scarce. However, Penaeid shrimps have been well studied. Chu *et al.* (1995), Kumlu *et al.* (1999) and Prasad (2001) reported the length weight relationships of *Penaeus monodon* reared in semi-intensive culture systems.

Nigerian freshwater prawns have been investigated previously. Abohweyere and Falaye (2008) investigated population parameters of *Macrobrachium vollenbonii* in the Lagos –Lekki

Lagoon and discovered that it exhibits two peaks of unequal strength in recruitment pattern. This tallies with Nurul Amin *et al.* (2009) who reported that Sergestid shrimps (*Acetes* spp.) from the Coastal Waters of Malacca Peninsular Malaysia consisted of two dominant age groups. Also, Bello-Olusoji *et al.* (2004) studied the morphometric features of rocky waterfall prawn from Erin-Ijesha in South-West Nigeria and concluded that the species belong to the infraorder Caridea, family Atyidae and genus *Caridina*. In the Mu River, Okayi and Iorkyaa (2004) reported the biology of *Atya gabonensis* and *Macrobrachium felicinium*.

According to Kim *et al.* (2008), freshwater palaemonid shrimp, have particular commercial value as fishing bait and food. Arimoro and Meye (2007) reported that prawns are highly valued as human food in Nigeria. In

the local markets close to freshwater streams of the Niger Delta they are sold either fresh or dried. Penaeid shrimps have been cultured for quite some time (Prasad, 2001; Araneda *et al.*, 2008).

Freshwater shrimp constitute one the most desirable candidates for freshwater aquaculture. However, Marioghae (1987) reported that in Nigeria as indeed in most countries in Africa, palaemonid prawn culture has not been

attempted on substantial scale. Recognising the existing potential, this study aimed to assess the possibility of culture, taking into account current knowledge of the biology of the various local shrimp species.

The study presents information on the size distribution, length – weight relationship and relative conditions of *P. africanus* and *D. bislineata* in the MU River, fiidi – Makurdi.

3 MATERIALS AND METHODS

3.1 Study site: The study area, River MU, is a tributary of River Benue into which it drains during high flood. Pools of water are left behind on deep parts of the riverbed when the River dries up in the dry season. River MU joins the great Benue River somewhere behind km 5 Gboko road i.e. Benue Breweries in Fiidi

ward and moves from Gwer passing Ikpayongo through Ugoundu (Apir) before entering Makurdi after Air force Base. It then moves down to km 5 Gboko road to discharge into the River Benue. The River MU is situated between latitude 7°39'N - 7° 57'N and longitude 8°26' E and 8°45' E.

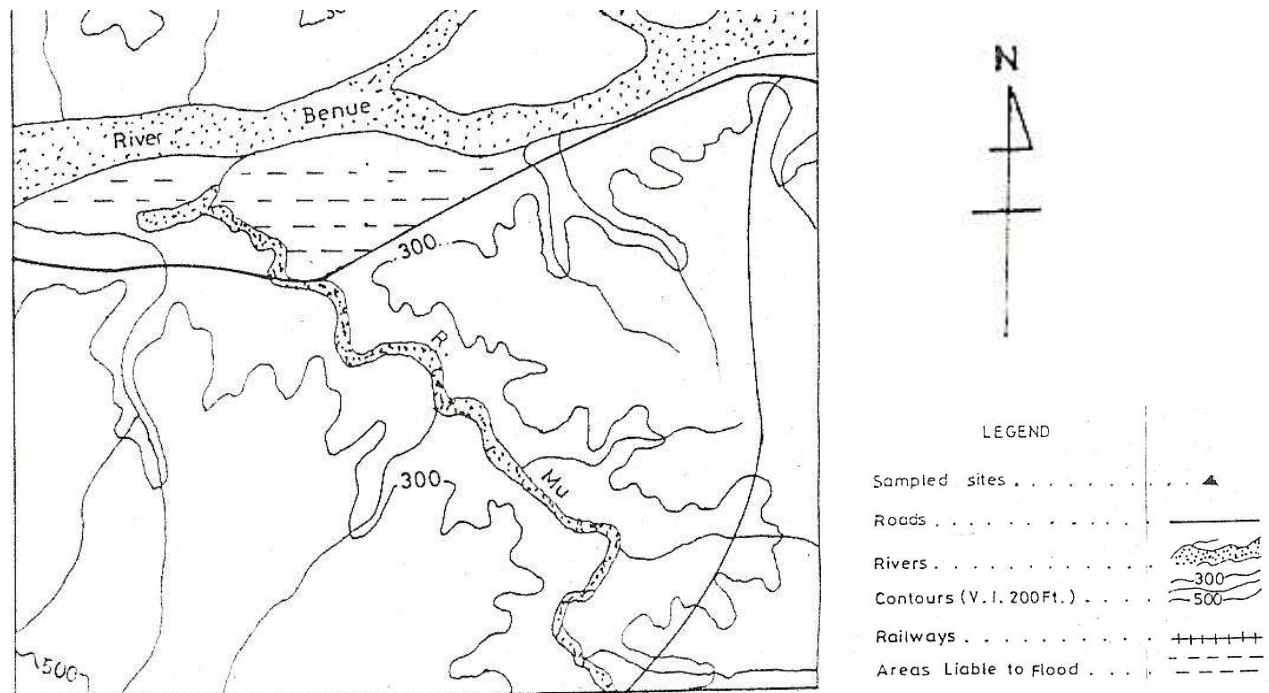
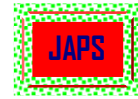


Figure 1: Topographical map showing River Mu.

3.2 Prawn sampling: The prawns were collected from two sampling sites on the MU River between September 2002 and April 2003 using brush traps placed at specific locations in

water along the river bank. Baskets were used to collect the samples.

The total lengths were measured from the tip of the telson to the tip of the dorsal



teeth using meter ruler and the weights were taken using digital weighing balance. For each species or population, the parameters ‘a’ (intercept) and b (exponent) of the Length – Weight Relationship (LWR) were determined as follows:

$W = aL^b$ that is log transformed as $\text{Log } W = a + b \text{ Log } L$; with

Length expressed in ‘cm’ and weight in ‘g’. FISAT II (Fish Stock Assessment Tools) was used for this analysis.

The Fulton condition factor (K) for each species was calculated from the equation:

$$K = \frac{100.W}{L^3}$$

where: K , condition factor,
 L , standard length (cm),
 W , weight (g).

4 RESULTS

The length – weight relationship of the two species is presented in figures 1 and 2. The values of b for these species are less than 3 (Table 2) suggesting that they exhibit negative allometric growth. There is a strong correlation

between the lengths and weights of these species judging from the regression coefficients of 0.6362 and 0.5342 for *P. africanus* and *D. bislineata*, respectively.

Table 1: Condition Factor and summary of lengths and weights of two fresh water prawns in River – MU, Makurdi, Benue State, Nigeria

Species	Total Length (cm)			Weight (g)			N	Condition Factor ± S.E.
	Min	Max	Mean ± S.E	Min	Max	Mean ± S.E.		
<i>P. africanus</i>	3.90	10.50	6.70 ± 0.24	1.00	34.50	7.17 ± 1.06	59	1.72 ± 0.093
<i>D. bislineata</i>	4.30	9.60	6.12 ± 0.18	1.00	18.00	4.62 ± 0.59	56	1.67 ± 0.091

N-sample size; SE-standard error

The various ranges and means of water quality parameters are presented in table 2.

Table 2: Length-weight relationship parameters of *P. africanus*, and *D. bislineata* from River Mu at Makurdi, Benue State Nigeria.

Species	N	a	b ± S.D.	95% CI of b	r
<i>P. africanus</i>	59	-1.1342	2.1942 ± 0.2198	1.7634 – 2.6249	0.7976
<i>D. bislineata</i>	56	-0.8558	1.7962 ± 0.2283	1.3488 – 2.2436	0.7309

N-sample size; a and b-parameters of the length-weight relationship; SD-standard deviation of the slope b; CI-confidence interval; r – coefficient of correlation.

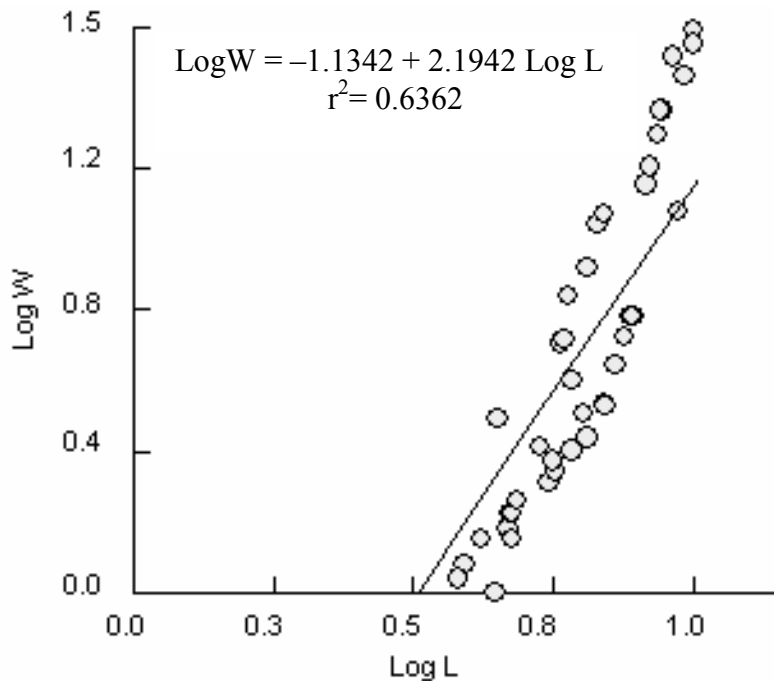


Figure 1: Length – Weight Relationship of *P. africanus* in River Mu – Makurdi, Nigeria.

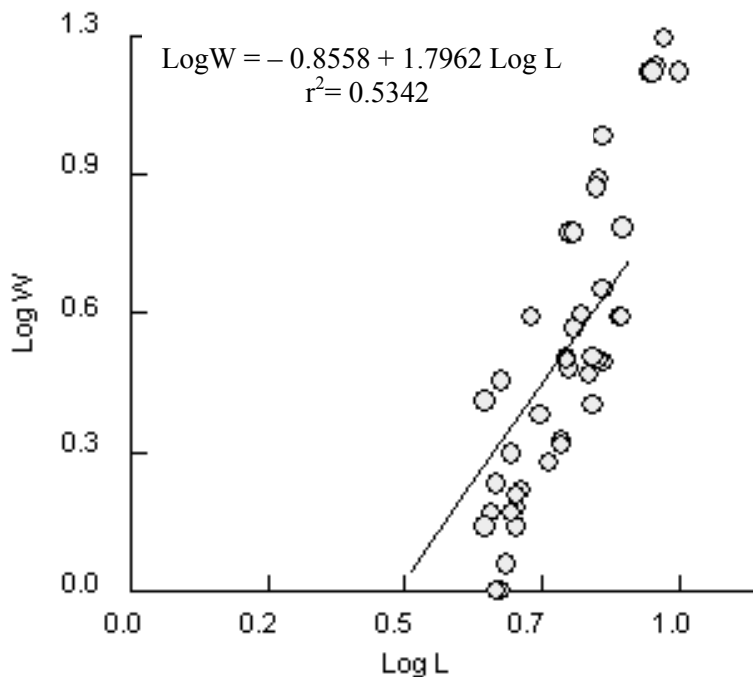
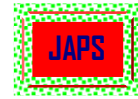


Figure 2: Length – Weight Relationship of *D. bislineata* in River Mu – Makurdi, Nigeria.

5 DISCUSSION

Araneda *et al.* (2008) reported condition factors for the White shrimp *Penaeus vannamei* cultured in freshwater at three densities. The highest condition factor value (0.674) was produced in

the 180 shrimps m^{-2} treatment, followed by 130 (0.670) and 90 shrimps m^{-2} (0.663) treatments. These condition factors are obviously lower than the values of 1.72 and 1.67 reported here



in our study for *P.africanus* and *D. bislineata*, respectively. This is because the shrimp *Penaeus vannamei* is not naturally adapted to freshwater. Okayi and Iorkyaa (2004) reported condition factors of 1.014 and 2.031 for *Atya gabonensis* and *Macrobrachium felicinum* in Mu River. These values are comparable to those being reported for the two species currently under study.

The parameter 'b' of the length – weight relationship of the two species under study are less than three (2.1942 and 1.7962) for *P. africanus* and *D. bislineata*, respectively. These values suggest negative allometric growth which is in contrast with the values of 3.411 [Allometric (+)], 3.063 [Isometric] and 3.249 [Allometric (+)] for *Acetes indicus*, *Acetes japonicus* and *Acetes intermedius*, respectively, from the coastal waters of Malacca Peninsular in Malaysia as reported by Nurul Amin *et al.* (2009).

Values of 'b' that are less than three were reported by Chu *et al.* (1995). These include 2.84 and 2.89 for two penaeid shrimps *Metapenaeus ensis* and *Metapenaeus joyneri* from the Zhujiang estuary, China. Kumlu *et al.* (1999) reported the length –weight relationship of the two penaeid shrimps *Penaeus semisulcatus* and *Metapenaeus stebbingi* inhabiting Yumurtalik Bight in Iskenderun Bay (North-Eastern

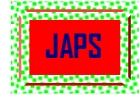
Mediterranean). Male and female *M. stebbingi* had lower 'b' values (2.67 and 2.96, respectively) while male and female *P. semisulcatus* had values of 3.04 and 3.25, respectively. The values reported for these are higher than those of prawns in the present study. This is most likely due to differences in habitat and genetic make up.

Okayi and Iorkyaa (2004) reported isometric growth for *A. gabonensis* and *M. felicinum* in River Mu with 'b' values of 2.989 and 3.003, respectively. They were of the opinion that isometric growth is as a result of availability of food and sufficient space to support the biomass. In line with this, Araneda *et al.* (2008) reported higher 'b' values for White shrimp *Penaeus vannamei* cultured in freshwater at lower densities. These include 3.07 at 90 shrimps m⁻², 2.99 at 130 shrimps m⁻² and 2.97 at 180 shrimps m⁻². This suggests crowding and competition for food as factors that inhibit growth and therefore affecting the value of 'b' in the length-weight relationship of any species.

Conclusively, the two species under study exhibited negative allometric growth and they were in good condition. More research to understand their biology ought to be carried out especially the reproductive biology so as to enhance their candidacy for aquaculture.

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