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Full Length Research Paper

Stock assessment of shrimps and prawn species of the lower Benue and Niger river, Nigeria

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The shrimps were collected from three sampling sites: on the River Benue at Makurdi, Benue state, on the River Niger at Jebba and Lokoja at Kogi state from January to April, 2011. *Macrobrachium felicinum* and *Atya gabonensis* were sampled during this period, with *A. gabonensis* occurring more abundantly. Condition factors of freshwater shrimps *A. gabonensis* from the two water bodies in Nigeria range from 1.875 for species in Jebba in March to 3.330 for Lokoja in March. The parameter "b" of the length – weight relationship of the fresh water shrimps are less than three (ranging from 1.0233 for species from Lokoja in April to 2.7717 for species from Makurdi in Feburary). These values suggest negative allometric growth. The length frequency of freshwater shrimps sampled shows that peak populations of length groups occurred in April for species from Jebba and Makurdi while peaks occurred in January for species from Lokoja. Peak frequencies were observed in length of 4.0 – 5.4 cm and 8.5 – 9.9 cm in January as well as 5.5 - 6.9 cm for species from Lokoja and in the group of 5.5 – 6.9 cm in April for species from Makurdi and 7.0 – 8.4 cm in April for both Makurdi and Jebba.

Key words: Stock assessment, Shrimps and River Benue and Niger, Nigeria**.**

INTRODUCTION

Shrimps constitute a large group of crustacean varying in size from few millimeters to about 35 cm long. They are valued food organisms that are heavily exploited in West Africa, it is very important export commodity (Chemonics International Inc, 2002; Enin, 1998). The reliance on wild catches in meeting the shrimp demand of the vastly growing Nigerian population is associated with several problems. These include depletion of the wild stock with the rapidly increasing catching effort. The cultivation of shrimps in certain parts of the world has made shrimp farming an important global aquaculture sector (Yakubu and Onunkwo, 2006). Of the farmed aquaculture species, shrimps constitute a significant proportion. Shrimps are highly relished and among the leading priced sea food on the global menu (Zabbey, 2007).

Nigeria is among tropical countries endowed with rich shrimp resources. According to Dublin – Green and Tobor (1992), the coastal waters of Nigeria are characterized by abundance of important living resources including shrimps, predominately members of the family penaeidea with production capacity of 12,000 metric tons (M.T) per year, Nigeria's shrimp supply is presently from capture fisheries, most of which is processed and exported to the developed world. Shrimp fisheries could be classified into two; the industrial or large scale shrimp fisheries which are highly organized and major source of shrimp export, the small scale shrimp fisheries involves numerous rural persons operating motorized and non motorized boats to catch shrimps in creeks and rivers of littoral communities. Most shrimps caught in the small scale sector are consumed internationally (CEHRD, 2007). There are large varieties of prawns and shrimp inhabiting the water bodies of Nigeria. The most common prawn species found in Nigerian rivers are the *Macrobrachim* species (Holthius, 1980); freshwater prawns abound in Benue river system. In River Mu, Fiidi and Makurdi, Okayi and Iorkyaa (2004) reported the

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biology of *A. gabonensis* and *Macrobrachium felicinum*. According to Kim *et al.* (2008), freshwater palaeminid 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 fresh water streams of the Niger Delta, they are sold either fresh or dried. The freshwater prawns are entirely fished from the wild and harvested as far inland as 250 km in various river systems and lakes mainly in the southern part of Nigeria. A few species such as *A. gabonensis* occur inland around the middle belt area, especially Makurdi. They are fished using mainly fishing traps which are usually baited with fish, coconut, cassava, onions and palm kernel nuts (Chemonics International, Inc, 2002). In Nigeria, oil co-operations, like the Shell Development Company (SPDC), have indicated interest in shrimp culture in the Niger Delta (Business Day, 2004). Indigenous fisheries professionals have also thrown their weights behind shrimp farming investments in Nigeria (Sogesan *et al*., 2004) and most recently sulalanka, a Srilanka Consortium secured the approval of the Federal Government of Nigeria and FAO to commence inland culture of marine black tiger shrimp (This Day, 2008). Nigeria already has a shrimp industry based on capture not culture. Nigeria lands around 250,000 -350,000 tons of shrimp annually of which about 55% is marine shrimp with the balance in freshwater shrimp (Chemonics International, 2002). This paper was aim at studying and identifying the available species of prawns in the rivers from the three states and to elucidate their stock assessment to determine their suitability to aquaculture.

MATERIALS AND METHODS

The shrimps were collected from three sampling sites on River Benue at University of Agriculture river side, in Makurdi and River Niger at Jebba lake in Niger state, Ganaja river side in Lokoja, Kogi state. The specie *A. gabonensis* were gotten by scooping them out from under the rocks in the water using baskets or handpicked, while *M. felicinum* was gotten as by-catches in fishing nets. Shrimps were identified using the Powell (1982) key for identification.

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. The parameter 'a' (Intercept) and 'b' (Exponent) of the length – weight relationship (LWR) were determined as follows:

$W=aL^b$ that is Log transformed as LogW = a + b.LogL; 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 species was calculated from the equation:

$$K = 100.W/L^3$$

Where: K, condition factor

L, standard length (cm).

RESULTS

The results are given in the Tables 1 and 2.

DISCUSSION

Okayi and Iorkyaa (2004) reported condition factor of 1.014 and 2.031 for *A. gabonensis* and *M.* felicinum in Mu River. These values are lower compared to those being reported for the current study. The difference can be attributed to the water bodies involved. Araneda *et al.* (2008) reported condition factors for pacific white shrimp *Litopenaeus vannamei* cultured in freshwater at three densities. The highest condition factor value (0.674) was produced in the 180 shrimp m^{-2} treatments, followed by 130 (0.670) and 90 shrimp 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 *L. vannamei* is not naturally adapted to freshwater.

Value of 'b' for these freshwater shrimp species was less than 3 (ranging from 1.0233 for species from Lokoja in April to 2.7717 for species from Makurdi in February). These values suggest negative allometric growth which is in contrast with the value of 3.411 (Allometric (+)], 3.063 [Isometric] and 3.249 (Allometric (+)] for *Acetes Indicus*, *Acetes japanicus* and *Acetes intermeduis*, 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 Abohweyere and Williams (2008). These include 2.82 and 2.94 for females and male species of *Macrobrachion macrobrachion* respectively. The 'b' values of both sexes of *M. macrobrachion* exhibited negative allometric growth in Lagos Lekki Lagoon system which was also observed in *M. macrobrachion* from the cross river estuary according to Enin (1994) revealing that the environment is suitable for the species. This value reported for the female and male species of *M. macrobrachion* shows allometric growth as the present study, suggesting that the shrimps in this present study were in good condition and exhibit negative allometric growth.

Aranenda *et al.* (2008) reported higher 'b' values for white shrimp *Peanaeus 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 suggest crowding and competition for food as factors that inhibit growth and therefore affecting the value of 'b' in length – weight relationship of any species.

Peak length frequency of 5.5 cm – 6.9 cm and 7.0 cm – 8.4 cm occurred for species from Makurdi in the month of April and 7.0 cm – 8.4 cm for species from Jebba in April and 4.0 cm -5.4 cm and 8.5 cm – 9.9cm for species

Table 1: condition factors of freshwater shrimp *A. gabonensis* from two water bodies in Nigeria (between January and April, 2011). The condition factors range from 1.875 for species in Jebba in March to 3.330 for Lokoja in March, thus suggesting habitat difference and changing conditions all year round.

S/No	Month	Condition Factor (K±S.E.)		
		River Benue at Makurdi Benue State	River Niger at Jebba Niger State	River Niger at Lokoja Kogi State
1.	January, 2011	2.290±0.029	N/A	2.847±0.124
2.	February, 2011	2.645±0.017	2.531±0.073	N/A
3.	March, 2011	2.680±0.090	1.875±0.076	3.330±0.188
4.	April, 2011	2.800±0.036	2.567±0.287	2.647±0.286

Table 2: The length – weight relationship parameters of *A. gabonensis* from River Benue in Makurdi, Benue state and River Niger at Jebba, Lokoja. The values of 'b' for these species are less than 3 suggesting that they exhibit negative allometric growth.

a). January, 2011

Location	N	a	b ± S.D.	95% CI of b	r
Makurdi	165	–1.3510	2.6748±0.0773	2.5233 – 2.8262	0.9399
Jebba	–	–	–	–	–
Lokoja*	149	–0.8986	2.1568±0.0728	2.0140 – 2.2996	0.9254

b). February, 2011

Location	N	a	b ± S.D.	95% CI of b	r
Makurdi	718	–1.3844	2.7717±0.0293	2.7142 – 2.8292	0.9622
Jebba	30	–0.4366	1.7453±0.1589	1.4194 – 2.0711	0.9009
Lokoja*	–	–	–	–	–

c). March, 2011

Location	N	a	b ± S.D.	95% CI of b	r
Makurdi	812	–1.3401	2.6946±0.0393	2.6175 – 2.7717	0.9235
Jebba	06	–0.1468	1.3560±0.2917	0.5449 – 2.1671	0.9186
Lokoja*	135	–0.6172	1.8840±0.1134	1.6618 – 2.1061	0.8216

d). April, 2011

Location	N	a	b ± S.D.	95% CI of b	r
Makurdi	1215	–1.3397	2.7321±0.0320	2.6694 – 2.7948	0.9260
Jebba	52	–0.4802	1.7482±0.1313	1.4910 – 2.0055	0.8833
Lokoja*	206	0.1247	1.0233±0.0479	0.9295 – 1.1171	0.8315

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.
*Comprises data from Lokoja and Idah.

from Lokoja in January. This result showed that there was a peak population of length group in the month of April for species from Jebba and Makurdi and in the month of January for the species from lokoja. Thus, indicating their abundance during the dry season.

Conclusion

The length weight relationship and condition factor revealed that the environment is suitable for these species found during this period. The length frequency

distribution showed that species had a peak population in the dry season in the month of April. More research should be carried out on their indigenous knowledge and reproductive biology so as to enhance their candidacy for aquaculture.

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