



Seasonal Abundance Of Freshwater Prawns *Atya Gabonensis* Giebel, 1875 And *Macrobrachium Felicinum*, Holthuis, 1949 In The Lower River Benue, Makurdi, Nigeria

C. Obetta¹, S G. Solomon² R.A. Obande² J.O Cheikyula²

1. Agricultural Research Council of Nigeria, P.M.B 5026, Wuse Abuja, Nigeria
2. Department of Fisheries and Aquaculture, University of Agriculture, P.M.B.2373Makurdi, Nigeria

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Email: okworcharity@yahoo.com

ABSTRACT

Samples of *A. gabonensis* were hand-picked under rocks and crevices by the aide of fishermen. *M. felicinum* were collected with non-return valves trap, from November 2013 to October 2014. Specimens were transported to the laboratory in icebox. A total of one thousand one hundred and thirty two (1,132) samples of both species were collected. *A. gabonensis* constituted 91.08% while *M. felicinum* constituted 8.92% of the total catch. *A. gabonensis* was in high abundance during the late dry season, March and April, with the catch of 14.64% and 12.54% of the total catch respectively. *M. felicinum* was in high number at the pick of rainy season with the most catch in July (5.57%) and August (3%). *A. gabonensis* had higher number of male than female except in February when the sex ratio was 1:1. *M. felicinum* had sex ratio of 1:3 M:F in both July and August. Water quality parameters were within tolerable ranges for prawn. It was concluded that *A. gabonensis* is in abundance in the Lower River Benue during the dry season and could be exploited for local consumption and export. *M. felicinum* is seasonal and can be harvested, with the seeds in July and August. This makes the species good for aquaculture.

INTRODUCTION

Shrimps and prawns constitute a large group of crustaceans varying in size from a few millimeters to about 35 cm long (FAO 1981). They are valued food organisms and heavily exploited in some parts of the world. They have been considered one of the most important internationally traded fishery products, which generates substantial economic benefits, especially for many developing countries (FAO, 2008). The consumption of prawns has significantly increased, especially in developed countries. This increasing demand has triggered intensive wild cropping and inspired farming of prawns to abridge the supply deficit (Zabbyet.al, 2010). The cultivation of prawns in certain parts of the world has made their farming an important global aquaculture sector (Yakubu and Onunkwo, 2006). Most of the prawn farming activities occur in the developing tropical and sub-tropical countries predominant in Asia and Latin America (Kautsky et al 2000). In Africa, shrimp farms exist in a variety of coastal and inland zones in Guinea, Gambia, Eritea, Egypt, South Africa, the Seychelles and Kenya (EJF 2004). Nigeria is also among the tropical countries endowed with rich shrimp and prawn resources, and exports shrimps and prawns to developed countries like USA, Japan, and some European nations (Zabby, 2010). With a production capacity of 12,000 MT annually, Nigeria's shrimps and prawns are at present entirely wild caught from the Niger Delta (Zabbyet al., 2010). The reliance on wild catches in meeting the demand of the vastly growing world population would result in depletion of the wild stock with rapidly increasing catching effort. Some researchers have reported the catch statistics of shrimp in Nigeria over the last few decades. Ajana (1996), reported landing of an average of 5 basins of prawns per fishing unit per day in the Niger Delta States of Nigeria. Ogbonna (2001) reported an annual catch of about 12,000 metric tonnes of prawns in Nigeria between 1992 and 1997 despite the maximum sustainable yield (MSY) of 3,500 - 4,000 mt. Studies have been carried out on the culture and biology of prawns in Nigeria. Some authors such as Holthuis (1980), Powell (1983), Anetekhai (1986) and Ayoola et al. (2009) have reported the presence of prawns and aspects of their biology in the Nigerian fresh and brackish aquatic ecosystem. Daekae and Ayinla (1995); Hart et al., (2003); and Opeh and Udo (2014) have revealed some indigenous species with potential for culture, these are: *Macrobrachium vollenhovenii*, *Macrobrachium macrobrachion*, *Macrobrachium equidens*, *Macrobrachium felicinum*. Miyajima (1977); Sandifer and Smith (1977); Smith et al. (1981) and Malecha (1983) provided data on the growth rates of cultured *Macrobrachium rosenbergii*. Data report on the growth rates of *Macrobrachium macrobrachion* fed on three types of meals were provided as well (Udo, 1991 and 2008). In these reports, not much was mentioned about their seasonal abundance. Despite all the research carried out on prawns of the genus *Macrobrachium*, there is little information about *M. felicinum*, which has been considered among the endangered species in the red list of IUCN because it is data deficient (De Grave 2013). This study,

seasonal abundance of *M. felicinum* and *A. gabonensis* in Lower River Benue, Makurdi is a contribution to existing knowledge in the biology of prawns.

MATERIALS AND METHODS

The study area was Lower River Benue, Makurdi, which is located on latitude 7° 55' and 7° 56' North of equator and longitude 8° 20' and 8° 40' East of the Greenwich meridian. River Benue (figure 1) originates from Adamawa hills and flows from the Southern part of Cameroon through Makurdi and Southwards to Lokoja where it forms a confluence with River Niger. At bank full, the area of Lower River Benue is about 129,000 hectares with as much as 25m difference between high and low water levels.

Prawn Sample Collection and Identification

A total of one hundred and one (101) specimens of *M. felicinum* one thousand and thirty (1,030) specimens of *A. gabonensis* were hand-picked under rocks and crevices under the water by the help of fishermen who dived in, while *M. felicinum* were trapped using unbaited local non-return basket trap made of bamboo and a non-return set trap. The collected samples were transported live to the fisheries laboratory, University of Agriculture, Makurdi laboratory in ice box containing water. The prawns were identified to the species level, using keys provided by by Fischer et al. (1981) and Powell (1982).

Sex Determination

The sexes were determined with the aid of specific morphological features that were peculiar to different sexes. The features used were size, presence or absence of reproductive chamber and presence of nubs on the abdominal segments (Anetekhai, 1990; Grooves, 1985).

Sex Ratio

The sex ratio was determined by counting the number of the male and female prawns caught monthly during the period of the study. Water Quality Analysis: The water quality parameters were monitored daily and examined using digital water parameter checker (Hanna waterproof digital tester H198129 and Lutron DO meter DO5509 for measuring dissolved oxygen).

Data analysis

All statistical inferences were based on a significant level of 0.05 probability level and calculated using SPSS 17.0.

RESULTS AND DISCUSSION

A total of 1132 prawns comprising of two species of caridea were collected during the study period (November 2013 to October 2014). These were the Gabon shrimp, *A. gabonensis* Giebel, 1875 belonging to the family Atyidae, and the Niger River prawn, *M. felicinum* Holthuis, 1949 in the family Palaemonidae. *A. gabonensis* (1,031) constituted 91.08% of the total catch during the study period while *M. felicinum* (101) was 8.92%. At the onset of sampling in November, 91

(8.83%) of *A.gabonensis* were collected. This gradually increased to a peak in March when 151 (14.65%) were collected. By April to October, the number caught started declining. *M.felicinum* was abundant in July and August and most of them were females (both berried and spent) and only four specimens were observed in February and March. *A. gabonensis* predominated in the catches with monthly catch ranging from 18 in October 2014 to 153 in March 2014 (Table 1, Figure 2)

A. gabonensis in prefers shallow water with less turbidity and low current velocity. This may be responsible for abundance of these species during the dry season (November to March). Bayagbona (1979), Kusemiju (1975) and Adetayo and Kusemiju (1994) made similar observations when they reported peak of highest catch of prawns to be in the dry season months in Lagos area. Fishing activities generally were reduced during the rainy season period because fishermen encountered difficulties in diving and setting their nets and traps due to flooding and ferocity of the river.

Powell (1982) attributed lack of prawn catches in fishermen loadings to inaccessibility of them to fishermen due to high water depth, lack of water transparency and high current or velocity.

Unlike *A. gabonensis*, *M. felicinum* occurred between July and August when water depth was high. It is suspected that *M. felicinum* breeds in July and August, since the specimens caught were mainly females, which were either berried or spent. This also shows that they might have migrated, from a more saline environment to the freshwater body, for spawning. Monod (1964), Powell (1976; 1977, 1979; 1980) made similar observations that *M. felicinum* prefers large clear waters.

Specimens of *A. gabonensis* collected from Lower River Benue were 629 males while 402 were females, giving an overall sex ratio of 1:0.6 (M:F). The monthly variations in the sex ratio are shown in Table(ii). The highest number of male to female was observed in December and January, with a ratio of 1:0.3 in each of the months, except in February (1:1 M:F) and May (0.8:1 M:F), every other months, in which samples of *A. gabonensis* were collected, had higher ratio in favour of males. The sex ratio in *A. gabonensis* (1:0.6) M:F shows that population of *A. gabonensis* in Lower River Benue has more males than females. This may be attributed to their genetic characteristics. Obande (2006) and Solomon et al. (1999) recorded

sex ratio of 1:0.7 and 2: 1 M:F respectively, in the same area for *A. gabonensis*. Almeida et al. (2009) observed a sex ratio of 1.0.1 male/female for *Atyascrabra*; Martonez – Muyen and Roman – Contreras (2000) had similar observation and attributed it to an intrinsic characteristic of the species of this genus.

M. felicinum encountered in February, March, July and August; 81 were females while 20 were males, giving a sex ratio of 1:4 in favour of females. The four specimens encountered in February and March were all males; 63 specimens were collected in July, only 15 were males; and 1 specimen out of 34 collected in August was a male as shown in Table 3. On the contrary, *M. felicinum* showed evidence of polygamy as indicated by a overall sex ratio of 4 females to one male. This could mean that this area is a breeding ground and mostly, the female that are berried come here to spawn. It could equally be due to their behavior during breeding season when female actively search for males which are territorial. As the females search, they become more vulnerable to the fixed gear in use. Anetekhai (2002) reported similar observation in *M. vollehovenii* in Asejire Lake and attributed it to vulnerability of female during breeding season when female actively search for male. The recruits of *M. felicinum* were absent from the catch. It is either that they do not forage to this area or the gear in use was selective for adults. If neither of these theories is true, it means that the population of prawns in this water is likely going to decline since recruitment is not taking place.

Water quality parameters were within tolerable ranges good enough for the survival of prawns as shown in table (iv). The amount of dissolved oxygen was in the range of 5.9 – 9.8mg/L with a mean of 7.24mg/L±0.34, pH had a mean of 6.8±0.29 with a range of 5.6 – 8.9, temperature ranged from 20.6 – 32.2°C with a mean of 26.4°C±1.03, conductivity had a range of 95 – 150µ/Scm and a mean value of 123.83µ/Scm±5.41, range of 12 - 28mg/l and mean value of 19.42mg/L was recorded for alkalinity, total dissolved solids had a range of 48 – 76ppm with a mean of 63.83ppm, ammonia had a mean value of 0.25mg/L and ranged from 0.1 – 0.5 mg/L, BOD ranged from 3.6 – 6.2mg/L and had a mean value of 4.84 mg/l±0.24 and transparency was in the range of 0.11 – 0.7m with a mean of 0.35m±0.06.

Table 1: Percentage Seasonal Abundance of Prawns from Lower River Benue

Month	Total catch	<i>A. gabonensis</i>		<i>M. felicinum</i>	
		No.	%of total catch	No.	% of total catch
November	91	91	8.04	0	0
December	99	99	8.75	0	0
January	120	120	10.60	0	0
February	127	125	11.04	2	0.18
March	153	151	14.64	2	0.18
April	142	142	12.54	0	0.00
May	104	104	9.19	0	0.00
June	71	71	6.27	0	0.00
July	108	45	3.98	63	5.57
August	73	39	3.45	34	3.00
September	26	26	2.30	0	0.00
October	18	18	1.59	0	0.00
TOTAL	1132	1031	91.08	101	8.92

Table 2: Monthly Variation in Sex Ratio of *Atyagabonensis* from Lower River Benue, Nigeria November 2013 to October 2014.

Month	Total no. of Male	Total no. of Females	Total Catch	Sex Ratio (M:F)
Nov.	51	40	91	1:0.8
Dec.	74	25	99	1:0.3
Jan.	80	40	120	1:0.5
Feb.	62	63	125	1:1
March	90	61	151	1:0.7
April	77	65	142	1:0.8
May	49	55	104	0.8:1
June	21	18	39	1:0.9
October.	125	35	160	1:0.3
Total	629	402	1031	1:0.6

Table 3: Sex Ratio of *Macrobrachium felicinum* caught in July and August, 2012.

Month	Total no. of Male	Total no. of Females	Total Catch	Sex Ratio (M:F)
July	15	48	63	1:3
August	1	33	34	1:33

Table 4: Sex Ratio of *Macrobrachium felicinum* caught in July and August, 2012.

Parameter	Mean±S.E	Range
Temperature(°C)	26.4 ±1.03	20.6 – 32.2
Conductivity (µ/Scm)	123.83 ± 5.41	95 – 150
Alkalinity(mg/L)	19.42 ± 1.49	12 – 28
Dissolved Oxygen(mg/L)	7.24 ± 0.34	5.9 – 9.8
pH	6.8 ± 0.29	5.6 – 8.9
Total Dissolved Solids(ppm)	63.83 ± 2.6	48 – 76
Ammonia (mg/L)	0.25 ± 0.04	0.1 – 0.5
B.O.D (mg/L)	4.84 ± 0.24	3.6 – 6.2
Transparency (m)	0.35 ± 0.06	0.11 – 0.7



Map of Lower River Benue showing Makurdi, the sampling site

Fig 1: Map Showing River Benue, the Site for Sample Collection. Source: wikipedia.com (2015)

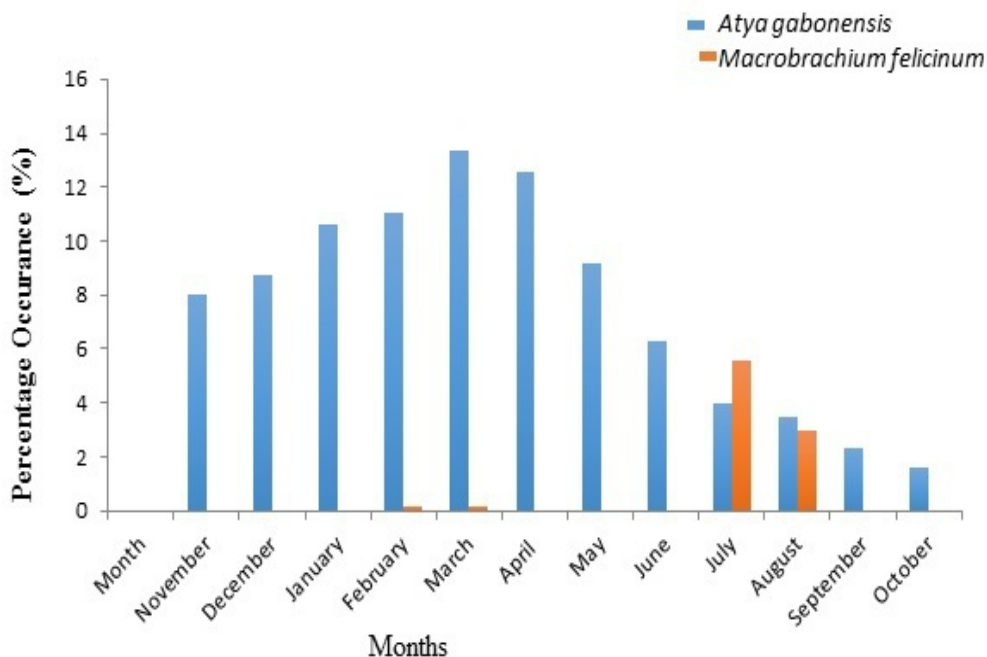


Fig 2: Seasonal distribution of two species of prawns (*A.gabonensis* and *M. felicinum*) in Lower River Benue, Nigeria.

CONCLUSION

Atyagabonensis and *Macrobrachium felicinum* are the main prawns found in the catches of Lower River Benue. *Atyagabonensis* is larger and more abundant than *Macrobrachium felicinum*. Both are purely fresh water and can compete with *Macrobrachium vollehenveni* for recruitment into freshwater aquaculture. *Atyagabonensis* showed superiority in size and distribution pattern in comparison with *Macrobrachium felicinum*. However, for collection of brood stock of *Macrobrachium felicinum* for commercial production, Lower River Benue is recommended, when water level is high, from July to August. The exploitation and subsequent culture of these stocks from River Benue would reduce over dependence on fin fishes and also enhance the nutritional intake and income of the local fishermen and the community.

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