

***Macrobrachium macrobrachion* (Herklots, 1851) Morphology and Abundance in Luubara Creek, Ogoni Land, Niger Delta, Nigeria**

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Abstract: *Macrobrachium macrobrachion* morphology and abundance in Luubara creek, of Ogoni Land, in the Niger Delta region of Nigeria was studied for a period of two years (January, 2006 to December, 2007). It was not different from other *Macrobrachium* species. The body is divided into three main divisions: the head, thorax and abdomen. The head and thorax are joined to form a cephalothorax, containing the mandibles, flagella, rostrum and the eyes containing a stalk containing five pairs of walking legs. The abdomen contains six body segments with last segment bearing a uropod (telson). The other five segments bear swimming apparatus (swimmerets). The second walking legs are modified to form the chelae and distinctively colored either blue or brownish colors. The legs contain hairs (furs). Mature males are considerably larger than females. The second walking leg of the male is thicker. Cephalothorax is also proportionally larger in the male than female while abdomen is narrower in the female. Genital pores of the male are between the bases of the fifth walking leg. The female genital pores are at the base of the third walking legs. Abdomen pleura are lower and the abdomen broader in female than male. Female pleura form a brood chamber that carries eggs between laying and hatching. A ripe ovigerous female can easily be identified with large orange-colored mass ovaries occupying a large portion of the cephalothorax. Station 1 had total 385 shrimps in 2006 and in 2007 the total number of shrimps was 246. The highest number of female shrimps was recorded in March 2006 while no shrimps were observed in September 2006. The least number of females was recorded in October 2006 and in September and October 2007. The least number of males was recorded in June 2006 and in September, 2007; while the highest number of males was in February, 2006 and January 2007. In terms of sex ratio, the females were more than males (1:1.6). The total number of shrimps obtained in station 2 was 1,006 out of which 378 or 35.57% were males while 628 or 62.42% were females. In station 2, the highest number of shrimps was recorded in January 2006 while the lowest was in September 2006. Also in 2006, highest number of males was recorded in January while the least number of males was in September. In 2007, the highest number of males was recorded in January, 2007 and the least in October. The highest number of females was recorded in March, 2006 while the month of December, 2006 recorded the least number of females. In 2007, the highest number of females was in October, while the lowest number of females was in April. Other species recovered from the trap were *Macrobrachium vollenhovenii*, *M. equidens*, *Hemichromis fasciatus*, *Tilapia guineensis* and *Sarotherodon melanotheron*. Station 3 recorded the highest number of shrimps obtained during the study period. There were 1,603 shrimps out of which 597 or 37.24% were males while 1007 or 62.75% were females. In 2006 the highest number of males was obtained in March while the least number of males were recorded in December, 2006. In females, the highest number was recorded in January 2006, while the lowest number of females was recorded in December, 2006. In 2007, the highest number of male shrimps was obtained in January while the lowest number was obtained in October 2007. For the females, the highest number was obtained in February while the least number of females was obtained in April, 2007.

Key words: Abundance, Luubara creek, *Macrobrachium macrobrachion*, morphology, Niger Delta, Nigeria, Ogoni land

INTRODUCTION

Macrobrachium macrobrachion is a fresh water shrimp. According to Powell (1980) the shrimp is

classified as follows: Phylum, *Arthropoda*; Class, *Crustacea*; Subclass, *Malacostraca*; Series, *Eumalacostraca*; Order, *Decapoda*; Suborder, *Natantia*; Section, *Caridea*; Family, *Palaemonida*; Genus,

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Macrobrachium; Species, *M. macrobrachion*. It is typically a freshwater species however found in low salinity brackish water (Powell, 1985).

Like other *Macrobrachium* species its body is divided into three main divisions: the head, thorax and abdomen. The head and thorax are joined to form a cephalothorax, which carries the mandibles, flagella, rostrum and the eyes containing a stalk and has five pairs of walking legs. The abdomen has six body segments with the last segment bearing a uropod or telson. The other five segments bear swimming apparatus known as swimmerets. A definite feature of *Macrobrachium* is that the second walking legs are modified to form the chelae. Most species are distinctively colored having either blue or brownish colors. The legs also have definitive features such as hairs or furs.

There are significant differences between male and female shrimps. Mature males are considerably larger than females and the second walking leg is much thicker. The cephalothorax is also proportionally larger in the male than female while abdomen is narrower in the female. In *Macrobrachium* the genital pores of the male are between the bases of the fifth walking leg (New and Singholka, 1982) whereas the female has the genital pores at the base of the third walking legs. The pleura of the abdomen are lower and the abdomen itself is broader in the female than in the male. The pleura of the female form a brood chamber in which the eggs are carried between laying and hatching. A ripe ovigerous female can easily be identified because the ovaries can be seen as large orange-colored mass occupying a large portion of the cephalothorax.

The gear used for collecting the shrimp is locally known as "Kara". It is cone shaped and has two non-return valve mechanisms at the center of the trap. The trap is constructed from either the blades of bamboo plant or blades of raffia fronds which are woven around three round frames made from cane. The total length of each trap was between 0.95 and 1 m while the opening aperture was between 25 and 30 cm. Fresh palm oil fruits were used as bait to set the trap along the creek lets against the water current.

Shrimps and prawns of the genus *Macrobrachium* and *Penaeus* are highly cherished by the people of the Niger Delta. They are used as condiments in the preparation of food because of their high protein value (Umoh and Bassir, 1977. Deekae and Idoniboye-Obu, 1995). They are highly priced and are in high demand in the market (Marioghae, 1990). It has been observed that there is significant reduction of the natural stock of shrimps in our coastal waters (Nwosu, 2007). This may be due to environmental degradation which is detrimental to the abundance and life cycle of *M. macrobrachion*. Also, there are few fishers now to exploit the available species as a result of rural migration.

The unfriendly fishing methods of local fishers who use poisons and chemicals are affecting the shrimp catch. Therefore understanding the biology, environmental parameters and population structure is essential to optimize production from the wild. The shrimp *M. macrobrachion* is exploited in Luubara creek Rivers State in large quantities yet there are no reports on the population biology of this species in the area. A study of the morphology and abundance of *Macrobrachium macrobrachion* from Luubara creek provides base line data for management decision in the management of the species in the area and similar water bodies.

MATERIAL AND METHODS

Study area: The study was carried out in Luubara creek, of Ogoni Land, in the Niger Delta region of Nigeria was studied for a period of two years (January, 2006 to December, 2007). The creek is a tributary of the Imo River and is located between longitudes 7°15'E - 7°32'E and latitudes 4°32' - 4°37'N in the eastern part of the Niger Delta. The upper part of the creek extends from Bori and meanders through Wiiyaakara, Luegbo, Duburo and joins the Imo River at Kalooko.

The creek is divided into two distinct sections brackish water and freshwater. The brackish water stretch is between Bane and Kalooko while the freshwater stretch extends from Bane to Bori. The brackish water area has the normal mangrove vegetation comprising of trees such as *Rhizophora racemosa*, *Avecenia africana*, *Laguncularia racemosa* etc., whereas the freshwater has dense vegetation comprising of large trees, various palms and aquatic macrophytes at the low intertidal zone. In freshwater area are *Cocos* sp., *Eliasis* sp., *Nymphaea* sp., *Lemna* sp. and *Raffia* sp. It is characterized by high ambient temperature usually about 25.5°C and above; high relative humidity which fluctuates between 60 and 95% and high rainfall averaging about 2500 mm (Gibo, 1988). This high rainfall often increases the volume of water in the creek hence providing good fishing opportunity for the residents. Fishing is one of the major activities going on along the creek because it is the main water route of the Khana people in Ogoni area of the Niger Delta.

The fishes caught in the area include *Chrysichthys auratus*, *C. nigrodigitatus*, *Hydrocynus forskalii*, *Clarias gariepinus*, *Pellonula leonensis*, *Malapterurus electricus*, *Gymnarchus niloticus*, *Synodontis nigri* *Hepsetus odoe*, *Hernichromis fasciatus*, *Tilapia zilli*, *Tilapia guineensis*, *Sarotherodon melanotheron* and *Eleotris senegalensis* and shellfish (crabs and shrimps) especially *Uca tangeri* *Callinectes amnicola*, *Goniopsis pelli*, *Cardisoma armatum*, *M. macrobrachion*, *M. vollenhoveni*, *M. equidens*, *Palaemonetes africanus*, *Caridina africana* and *Desmocariss tripisnosa*.

Table 1: Abundance of *Macrobrachium macrobrachion* at various stations sampled in Luubara creek

Stations	2006				2007			
	Male	Female	Total	Sex ratio	Male	Female	Total	Sex ratio
Station 1	152 (39.48%)	233 (60.51%)	385	1 male: 14 female	109 (44.30%)	137 (55.69%)	246	1 male: 1.2 female
Station 2	215 (37.71%)	355 (62.71%)	570	1 male: 16 female	163 (37.35%)	273 (62.61%)	436	1 male: 1.6 female
Station 3	347 (36.10%)	614 (63.89%)	961	1 male: 1.7 female	250 (38.88%)	393 (61.11%)	643	1 male: 1.5 female
Total male	1,236 (38.81%)							
Total female	2,005 (61.86%)							
Total Species	3,241							
Overall sex ratio	1 male: 1.6 female							

Sample collection: The shrimp samples were collected fortnightly from three stations along the creek: namely Wiiyaakara, Luegbo and Duburo. Selection of the stations was purposefully based on fishing activities, ecological zonation and accessibility of site. For each station five fishermen were engaged and three traps were used. At each station the fishermen set the three sets of traps against the water current among aquatic macrophytes and left them overnight. The traps were retrieved the following day after about twelve hours corresponding to another low tide. The shrimps collected at each station were sorted into male and female; females were later separated into berried (ovigerous) and non-berried (non-ovigerous). Sampling lasted for twenty-three months from January 2006 to November 2007. The shrimp samples were then preserved in 4% formaldehyde and transported to the RSUST Fisheries laboratory for analysis after each day's sampling. The species was identified by use of the keys of Powell (1980, 1982) and Holthius (1980).

RESULTS

Like other *Macrobrachium* species its body is divided into three main divisions: the head, thorax and abdomen. The head and thorax are joined to form a cephalothorax, which carries the mandibles, flagella, rostrum and the eyes containing a stalk and has five pairs of walking legs. The abdomen has six body segments with the last segment bearing a uropod or telson. The other five segments bear swimming apparatus known as swimmerets. A definite feature of *Macrobrachium* is that the second walking legs are modified to form the chelae. Most species are distinctively colored having either blue or brownish colors. The legs also have definitive features such as hairs or furs.

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form a brood chamber in which the eggs are carried between laying and hatching. A ripe ovigerous female can easily be identified because the ovaries can be seen as large orange-colored mass occupying a large portion of the cephalothorax.

A summary of the total number of shrimps collected at the various stations is shown in Table 1. Station 1 had total 385 shrimps in 2006 and in 2007 the total number of shrimps was 246. The highest number of female shrimps was recorded in March 2006 while no shrimps were observed in September 2006 (Fig. 1). The least number of females was recorded in October 2006 and in September and October 2007. The least number of males was recorded in June 2006 (Fig. 2) and in September, 2007; while the highest number of males was in February, 2006 and January 2007. In terms of sex ratio, the females were more than males (1:1.6).

The total number of shrimps obtained in station 2 was 1,006 out of which 378 or 35.57% were males while 628 or 62.42% were females. In station 2, the highest number of shrimps was recorded in January 2006 while the lowest was in September 2006. Also in 2006, highest number of males was recorded in January while the least number of males was in September. In 2007, the highest number of males was recorded in January, 2007 and the least in October. The highest number of females was recorded in March, 2006 while the month of December, 2006 recorded the least number of females. In 2007, the highest number of females was in October, while the lowest number of females was in April. Other species recovered from the trap were *Macrobrachium vollenhovenii*, *M. equidens*, *Hemichromis fasciatus*, *Tilapia guineensis* and *Sarotherodon melanotheron*.

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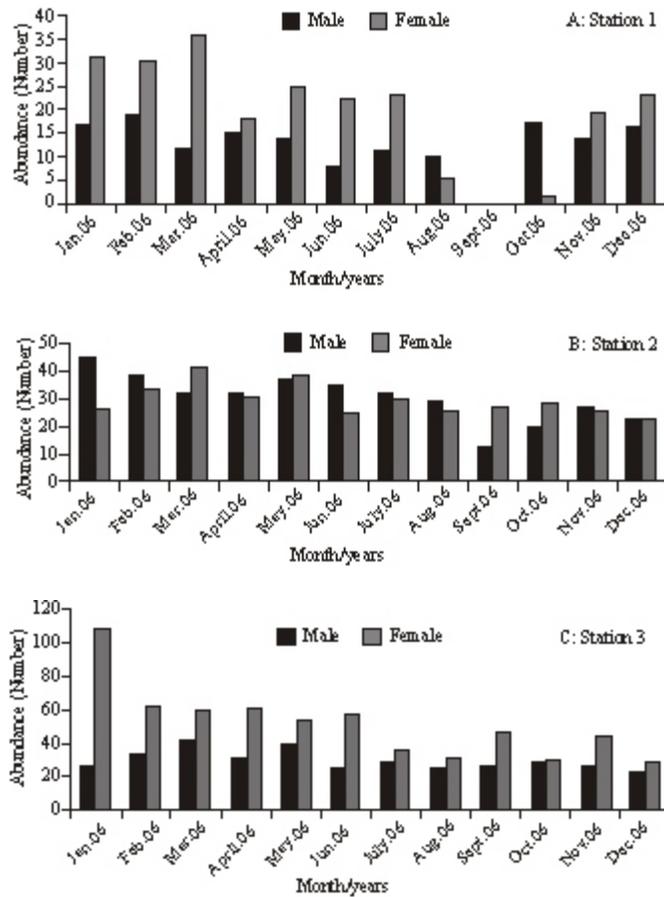


Fig. 1: Abundance of *M. macrobrachion* at the various stations of Luubara creek (2006)

DISCUSSION

Most of the shrimp catch was observed in the dry season months November- March. This observation is in contrast with the results of Enin (1998) for Cross River estuary, where he observed heavy catches between June and December which could be described as the wet and the early dry seasons. *M. macrobrachion* was obtained throughout the year in Luubara creek.

The all year round occurrence of *M. macrobrachion* may be related to the high fecundity nature of the species and the availability of berried females that can spawn. This trend resulted to catching of shrimp throughout the year. This is contrary to observation on the estuarine prawn *Nematopalaemon hastatus*, with poor catches in the middle of the rainy season in the New Calabar river estuary (Marioghae, 1980, 1981). He observed that catches were heavy in the dry than in the wet season which was also reported by Enin *et al.* (1991) for *N. hastatus* of the Cross River system.

The catches of *M. macrobrachion* in Luubara creek was observed to be dominated by females which totaled

2005 individuals (62.05%) as against males (38.25%) in the sample population. Amongst the three population groups, however, males (38.25%) were dominant followed by non ovigerous females (34.29%) and ovigerous females (27.76%).

When the shrimp sample population of the stations were subjected to analysis, there were significant differences between the population of male and female shrimps in station 1 ($p < 0.05$) but there were no significant differences between the population of male and female shrimps in station 2 ($p > 0.05$). However, there were significant differences in female shrimps in station 2 ($p < 0.05$).

There were also no significant ($p > 0.05$) observed in the male population in 2006 and 2007 in station 2. Also, no significant differences were observed between the yearly population of male and female in station 3 ($p > 0.05$). In the tropical region the important factors that affect distribution and abundance of shrimps are temperature, salinity, nourishment and substrates, (Costa and Fransozo, 2004). In the present study, there were positive relationship between shrimp population and

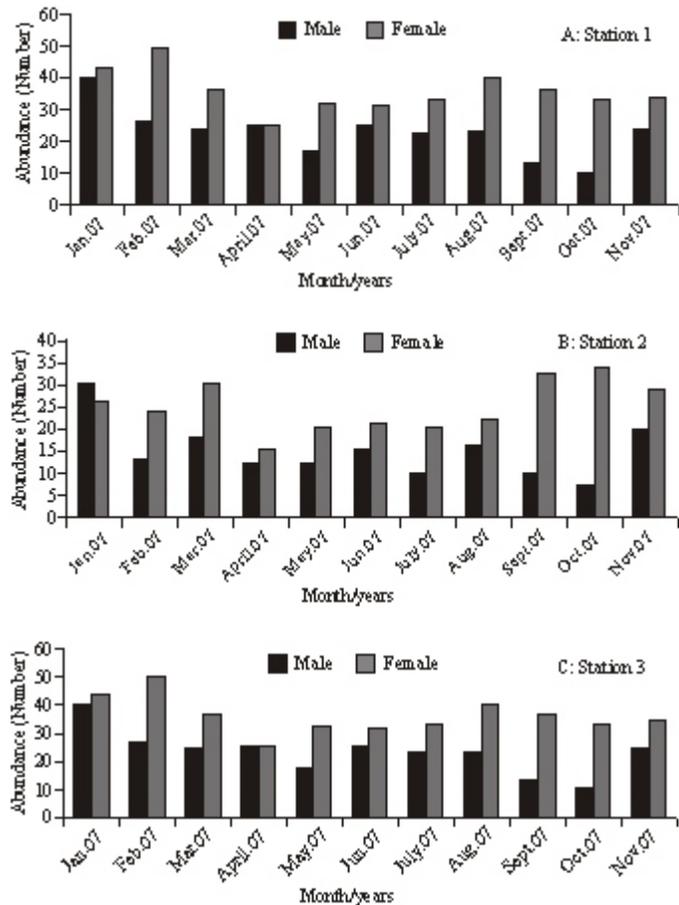


Fig. 2: Abundance of *M. macrobrachion* at the various stations of Luubara creek (2007)

ambient temperature, alkalinity, dissolved oxygen, salinity and rainfall.

M. macrobrachion have been reported to occur all year round (Powell, 1982). The abundance of an organism is determined by a number of factors, such as rainfall, temperature, light, pH and salinity. Others are concentration of dissolved gases, types of pollutants, presence or absence adequate of anions and cations, the nature of substratum, the number of predators and presence or absence of disease causing organisms (Williams, 1955; Loesh, 1965; Garcia, 1977). Zabbey (2007) is of the opinion that catches of coastal shrimps vary according to season. He reported that 60% of fishermen obtained good catches in the rainy season while 40% claimed that catches were better in the dry season.

Furthermore, 50% of local fishers who operate in the creek claimed that their peak period of catch was the rainy season while the remaining 50% mentioned dry season. Lack of catch data on abundance hinders comparative analysis. However, studies by Enin *et al.* (1991) on *Nematopalaemon hastatus* fishery in the outer estuarine region of Cross River, Nigeria showed that the catch rates

rose to a major peak (24%) between March and June i.e. end of dry season and early rainy season.

They also reported a secondary peak (17%) in October/November which is a period between rainy and dry season. According to their findings (Enin *et al.*, 1991), poorer catch rates were obtained in the middle of the rainy months of July and September. Waribugo (2005) reported that the two peak periods of abundance of *Nematopalaemon hastatus* and *Palaemon maculatus* in the Nun River estuary, Bayelsa State were between October and December and from March to April which coincides with early dry season and early rainy season respectively. Nwosu and Holzohner (2004) studied lunar and seasonal variations in the catches of *Macrobrachium* in Cross Rivers estuary and reported two maxima, May - July and November - December.

CONCLUSION

- *M. macrobrachion* from Luubara creek was not different from other descriptions.
- The body is divided into three main divisions: the head, thorax and abdomen. The head and thorax are

joined to form a cephalothorax, containing the mandibles, flagella, rostrum and the eyes containing a stalk containing five pairs of walking legs.

- The abdomen contains six body segments with last segment bearing a uropod (telson).
- The other five segments bear swimming apparatus (swimmerets).
- The second walking legs are modified to form the chelae and distinctively colored either blue or brownish colors.
- The legs contain hairs (furs). Mature males are considerably larger than females.
- The second walking leg of the male is thicker.
- Cephalothorax is also proportionally larger in the male than female while abdomen is narrower in the female.
- Genital pores of the male are between the bases of the fifth walking leg.
- The female genital pores are at the base of the third walking legs.
- Abdomen pleura are lower and the abdomen broader in female than male. Female pleura form a brood chamber that carries eggs between laying and hatching.
- A ripe ovigerous female can easily be identified with large orange-colored mass ovaries occupying a large portion of the cephalothorax.
- Most of the shrimp was caught in the dry season months November - March but occurred throughout the year.
- Shrimp fishing should therefore be monitored during the dry season for effective management of the fishery.

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REFERENCES

- Costa, R.C. and A. Fransozo, 2004. Abundance and ecologic distribution of the shrimp *Rimapenacus constrictus* (Crustacea: Penaeidae) in the northern coast of Sao Paulo, Brazil. *J. Nat. History*, 38(7): 901-912.
- Deekae, S.N. and T.I.E. Idoniboye-Obu, 1995. Some aspects of commercially important molluscs and crabs of the Niger Delta, Nigeria. *Environ. Ecol.*, 13(1): 136-142.
- Enin, U.I., 1998. The *Macrobrachium* fishery of the Cross River Estuary, Nigeria. *Arch. Fish. Mar. Res.*, 46(3): 263-272.
- Enin, U.I., U. Lowenberg and T. Kunzel, 1991. The *Nematopalaemon hastatus* (estuarine shrimp) fishery in the outer estuarine region of the Cross River, Nigeria. *Arch. Fischwiss*, 41(11): 67-88.
- Garcia, S., 1977. Biology and dynamic of populations of pink shrimp *Penaeus duorarum* notialis (Perez Farfante, 1967) in Cote d'Ivoire. Travel documents, ORSTOM, Paris, 79: 271 (In French).
- Gibo, A.E., 1988. Relationship between rainfall trends and flooding in the Niger- Benue River basin. *J. Meteorol.*, 13: 132-133.
- Holthius, L.B., 1980. Shrimps and prawns of the world: An annotated catalogue of species of interest to fisheries. *FAO Fisheries Synopsis*, 125: 271.
- Loesh, H., 1965. Distribution and growth of peneaid shrimp in Mobile Bay, Alabama. *Pub. Ins. Mar. Sci.*, 10: 41-58.
- Marioghae, I.E., 1980. The ecology and commercial fishery of *Palaemon (Nematopalaemon) hastatus*. Aurivillus, 1898. Thesis in Hydrobiology and Fisheries, University of Port Harcourt, pp: 70.
- Marioghae, I.E., 1981. The ecology and commercial fishery of *Palaemon (Nematopalaemon) hastatus*. *Auivillius* 1888. Nigerian Institute of Oceanography and Marine Research, Annual Report, pp: 11-12.
- Marioghae, I.E., 1990. Studies of fishing methods, gear and marketing of *Macrobrachium* in the Lagos Area. Nigerian Institute of Oceanography and Marine Research Technical Paper, No. 53, pp: 20.
- New, M.B. and S. Singholka, 1982. Freshwater prawn farming: Manual for the culture of *Macrobrachium rosenbergii*. *FAO Fisheries Technical. Paper*, 225, pp: 116.
- Nwosu, F.M. and S. Holzlohner, 2004. Lunar and seasonal variations in the catches of *Macrobrachium* fishery of the Cross River Estuary, South East Nigeria. *Indian J. Hydrobiol.*, 7(1-2): 177-181.
- Nwosu, F., 2007. The Problem of by Catch Associated with Industrial Shrimping: Implications for Inshore Demersal Fisheries in the Niger Delta. In: Zabbey (Ed.), *Small Scale Shrimp Fisheries in Nigeria*. Centre for Environment, Human Rights and Rural Development (CEHRD), Eleme, Rivers State CEHRD/TECH/CONSERV/01/2007, pp: 32-48.
- Powell, C.B., 1980. Key to shrimps and prawns (*crustacea: Decapoda, natantia*) of the Niger Delta Basin Development Authority Area. Consultancy Report, pp: 5.
- Powell, C.B., 1982. Fresh and brackishwater shrimps of economic importance in the Niger Delta. Proceeding 2nd Annual Conference Fisheries Society of Nigeria. Calabar 25-27 January 1982, pp: 254-285.
- Powell, C.B., 1985. The Decapods Crustaceans of the Niger Delta. In: Wilcox, H.B.R. and C.B. Powell (Eds.), *Publication Committee*. University of Port Harcourt, pp: 226-238.

- Umoh, I.B. and O. Bassir, 1977. Lesser known sources of protein in some Nigerian peasant diets. *Food Chem.*, 2: 315-329.
- Waribugo, S.A., 2005. Aspects of the biology and fisheries of some palaemonid shrimps in River Nun Estuary, Bayelsa State, Nigeria. M.Sc. Thesis, Rivers State University of Science and Technology, Port Harcourt, pp: 60.
- Williams, A.B., 1955. A contribution to the life histories of commercial shrimps (peneidae) in North Carolina. *Bull. Mar. Sci. Gulf Carribean*, 5(2): 116- 146.
- Zabbey, N., 2007. Small scale shrimp fisheries in Nigeria Centre for Environment, Human Rights and Development, Eleme, Rivers State. Technical Report, CEHRD/TESH/CONSERV/01/2007, pp: 64.