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Food and Feeding Habits of the Brackish River Prawn (*Macrobrachium macrobrachion*, Herklots, 1857) from Great Kwa River, Obufa Esuk Beach, Calabar, Cross River State, Nigeria.

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Abstract
The study investigated the stomach contents of *Macrobrachium macrobrachion* from the commercial artisanal catches in Obufa Esuk Beach along Great Kwa River, Cross River, Nigeria. Samples were collected for a period of six months from February, 2006 to July, 2006. The stomach analysis was carried out using frequency of occurrence and numeric methods. It was observed that the prawn fed on a variety of food items such as detritus; diatoms, sand, mud particle fish bone, insect part and flagellate which were consistent. In terms of percentage frequency of occurrence detritus topped the list of food items with 19.58% while unidentified invertebrates were the least food component 0.74% by number. Detritus, diatoms, unidentified algae, mud particles, sand were not numerically quantified. Fish bones were only counted in stomach where no fish remain occurred. The results indicated that *M. macrobrachion* can be considered as an omnivorous detritivore.
Keywords: Stomach analysis, Food items, *Macrobrachium macrobrachion*, Obufa Esuk Beach, Nigeria

1. INTRODUCTION

Freshwater prawns of the genus Macrobrachium are decapod crustaceans belonging to the family Palaemonidae. The palaemonids and penaeids have been globally identified as foremost in terms of economic importance and possibility of recruitment into aquaculture. *Macrobrachium* species are found in most inland freshwater areas including ponds, lakes, rivers and irrigation ditches, as well as in estuarine areas (New, 2002). These prawns occur throughout the West African region; however, of the about 200 species that make up the genus, four (4) species have been reported in Nigeria. These are *Macrobrachium vollenhovenii* (African river prawn), *Macrobrachium macrobrachion* (brackish water prawn), *Macrobrachium felicinum* (Niger River Prawn) and *Macrobrachium* dux (Congo River Prawn), with *M. vollenhovenii* and *M. macrobrachion* being the two largest species. These two species have been described to possess the highest commercial potential (Ajuzie and Fagade, 1992). 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. Consequent upon the aquaculture potential of this prawn, there is the need to provide information on its food and feeding habits. According to Wootton (1992), food and feeding habits are indispensable part of biological and taxonomic studies because it is an essential function of an organism as growth, development and reproduction are all dependent on energy that enters in the form of food. Prawns are known to feed on a wide variety of small epibenthic animals, especially polychaetes, molluscs and other crustaceans. This study therefore provides information on the food and feeding habits of the Brackish River Prawn, *M. macrobrachion.*

2. MATERIAL AND METHODS

The sample of *Macrobrachium macrobrachion* used in this study were obtained from the catches of the artisanal shrimp fishery at Obufa Esuk, one of the major shrimp landing beaches of the *M. macrobrachion* fishery in the outer estuary (Figure 1) of the Cross River. The samples were collected from February, 2006-July, 2006, involving a total of 200 shrimps. The estuary receives sea water from the Atlantic Ocean and freshwater from a number of rivers including the Cross River and Great Kwa River. During the peak breeding season (May-July), the adult of *M. macrobrachion* migrates from the freshwater of the Great River into the estuary for spawning and it is normally in the estuary are densely populated with mangrove trees, bamboo trees and some species of shrubs. There is also the presence of some coconut trees. The estuary has a brownish colouration and along contains part at low tides during the dry season submerged portions of the bottom re-emerge through a short period. The estuary is located in the tropical rainforest belt of southern Nigeria and lies between latitudes

4°15' and 4°45'N and longitudes 8°5' and 8°35'E. The estuary has a mean salinity of 20ppt during the dry season and approximately 12ppt at the peak of the rainy season (Udo and Ekpe, 1991)

2.1 SPECIMEN SAMPLING

Samples of *Macrobrachium macrobrachion* were collected from Obufa Esuk Beach lower section of Great Kwa River Bi-monthly for six months; these samples were always bought from the artisanal fishermen early in the morning between 7am and 8am. 200 species of *M. macrobrachion* comprising of nearly all size groups were use in this study. They were immediately injected with 4% of formalin to reduce the minimum of post-homous digestion (Coasta and Wanninayake, 1986) and were later transferred to the laboratory. In the laboratory, the total length (TL)cm, standard length (SL)cm, carapace length (CL) cm and body weight (gm) of the specimens measured to the nearest 0.1cm and 0.1g using a measuring board calibrated in cm and triple beam balance respectively. Total length to the nearest 0.1cm was considered to be the distance between the tip of rostrum and the tip of telson (Arringnon et al., 1994), standard length to the nearest 0.1cm considered to be the distance between the tip of the rostrum to the end of the 5th segment of the abdomen in cm with the help of a measuring tape and carapace length (the distance from the base of rostrum to the first body segment) was measured with a Vernier caliper to the nearest 0.1mm. The shrimps were then weighed with triple beam balance to the nearest 0.1 g. Measurements were taken for each monthly collection and recorded accordingly. For the food and feeding habit studies, the stomachs of collected prawns were dissected out with the contents washed into a Petri dish and examined under a binocular microscope (x100 magnification). The analysis of the stomach contents was carried out by both frequency of occurrence and numerical methods as described by Hyslop (1980). Various diet components were identified and enumerated with a Sedgjwick Rafter Counting Chamber and were categorized into algae, insect parts, unidentified organisms and sand grains. The respective guts were matched with the prawn being examined based on the methods employed by Marioghae (1982).

3. RESULT

A total of 200 stomachs of *M. macrobrachion* were examined. A wide range of food items were identified in dissected stomach (Table 1). In terms of percentage frequency of occurrence, Detritus topped the list of food items with 19.58%. It was closely followed by Diatom 17.80%, then come mud particle 10.87% and sand 9.61% followed by insect part, fish bone, unidentified green algae, bacterioplankton, flagellate followed in the list according to their order of importance scoring 7.74%, 7.52%, 6.47%, 4.47% and 5.58% respectively. This was then followed by less important food item like Microcystis 3.57%, poly-worm 2.16%, palm remains 1.71%, zooplankton, 1.64%, fibre, 1.12% and unidentified invertebrate 0.74% (Figure 2). With regards to percentage numerical abundance insect part come first as a single food item with 18.3%, widely followed by fish bone 15.1%, palm remain 12%, poly worm 12% and zooplankton 10% in their order of importance. Fibre, microcystis, bacterioplankton, flagellate and unidentified invertebrate followed in their order of importance, recording 9%, 8%, 7%, 5%, 5% respectively (Figure 2). Detritus, diatoms, unidentified algae, mud particles, sand grain were not numerically quantified. Fish bones were only counted in stomach where no fish remain occurred.

4. DISCUSSION

The knowledge of the diet of a species in nature is important for the establishment of its nutritional needs and of its interaction with other organisms (Albertoni *et al.,* 2003), and the presence of various food type (plants, animal and detritus) in the stomach of *M. macrobrachion* indicate that it is not only a primary and secondary feeder but also a detritivore. Marioghae (1982) classified the species as an omnivore because of its acceptance of baits and food types such as detritus, diatom, unidentified algae, bacterioplankton, zooplankton, mud, sand, palm fruit remains, fish bones, insect parts, flagellate, microcystis, unidentified invertebrate, fibres and polychaete worms. Similar kinds of food materials were found in the gut of *M. macrobrachion* in the present study. The juveniles need more food for growth while the adults need food for maintenance (Ricker, 1971). Detritus form the major food components of *M.macrobrachion* of Cross River Estuary. These results were consistent with that of Marioghae, (1982), who reported the ingestion of detritus as the major nutritional source of *M.vollenhovenii* of Lagos Lagoon. Sharma and Subba (2005) who reported that the prawns *Macrobrachium* species were omnivorous and that their diet included algae, detritus, insect parts, plant parts and other animals. Most aquatic animal species appear to be opportunistic feeders, consuming a large diversity of prey (Cortes, 1999), and results from this study indicate that the Brackish River Prawns are non-selective opportunistic feeders and their diets include a diverse species spectrum of diatoms, but with detritus being the dominant food items. The animal appears to feed on the available edible plankton in its environment (Jimoh et al., 2011). Abby-Kalio (1990) also reported that penaeid prawns are not selective in their feeding. Bello-Olusoji et al. (1995) observed that the bigger-sized *M. vollenhovenii* (7.8 cm and above) feed on a wide variety of organisms, both plants and animals, with polychaetes, small crustaceans and fish remains accounting for more than 40.85%. The gut contained various forms of food items which included zooplankton and some animal matter, and this agrees with what was

observed by Bello- Olusoji et al. (1995) that the prawn can function as a primary consumer, secondary consumer and detritivore in the aquatic system, and hence be classified as an omnivore. However, it was observed that plant matter was more common than animal matter in the gut contents of *M. macrobrachion*. The possible reason could be that animal tissues are digested relatively faster and that the animal observed in the gut actually represented undigested leftovers (Roy and Singh, 1997; Jimoh et al., 2011). Sand grains (9.61%) were also encountered in the guts of *M. macrobrachion*, and the presence of these sand particles in the gut of the prawn might be considered as incidental and associated with the bottom substratum to which some algal species are attached. The availability of detritus in riverine and estuarine areas is associated with the biodegradation of organic matter in that environment (Coasta and Wanninayake, 1986). The presence of palm remains in the gut of *M. macrobrachion* may not be unconnected with the use of palm fruits as bait by the artisanal shrimp fishermen. The absence of fish scales and bones in the stomach of juvenile of *M. macrobrachion* may have something to do with the size and nature of those items. Juvenile organisms are not capable of ingesting large sized and hard food items as a result of the tender nature of their digestive system (Bagenal, 1978).

5. CONCLUSIONS

The result of this study shows that *M. macrobrachion* is Omnivorous in its dietary habit. The wide range of food items attests to the fact that *M. macrobrachion* is predominantly a benthic feeder, unspecialized and non-selective in it diet. This is seen in the occurrence of different and quite unrelated benthic organisms in its diets (detritus, unidentified algae, zooplankton, fish bone, mud, sand grain and polychaete worms). The sluggish nature of this shrimp also goes to confirm its bottom dwelling habit. The results of this research also indicate that *M. macrobrachion* is a species that can be cultured in ponds with limited input with regard to feeding. However, more research is recommended on food and feeding habit of prawn especially among the juveniles, if profitable, intensive culture is targeted. This species is presently dwindling in numbers and only farm culturing can replenish the stock in the next decades.

REFERENCES

Ajuzie, C.C and Fagade, S.O. (1992). African River Prawn has commercial potential. *Fish Farmer*, 33-34pp.

Arringon, J.C.V., Hummer, J.V., Laurent, P.J., Griessinger, J.M., Lacroix, D and Autrand, M. (1994). *Warm Water Crustaceans*. The tropical Agriculturist. T.A Macmillian, the Netherlands.

Albertoni, E.F., Palma-Silva, C and Esteves, F. (2003). Natural diet of three species of shrimps in a tropical coastal Lagoon. *Brazilian Archive of Biological Technology*, 46(3): 395 – 403.

Abby-Kalio, N. J. (1990). Feeding and predation in penaeid shrimps of the Bonny and New Calabar estuaries of the Niger Delta. Paper presented at the 8th Annual Conference of the Fisheries Society of Nigeria, Akure. *Potential Fish Farmer*, 33-34pp.

Bello-Olusoji, O.A., Balogun, A.M., Fagbenro, O.A and Ugbaja, N. (1995). Food and feeding studies of the African river prawn *Macrobrachium vollenhovenii*. (Herklots, 1857). In: Lavens, P., Jasper, E., Rowlantes, I. (Eds.): Larvi '95 Fish and shellfish symposium, Gent, Belgium. *European Aquaculture Society*, 24: 425 – 427.

Bagenal, T.B. (1978). Aspects of fish fecundity in (Gerting, S.D.) (Ed) Ecology of freshwater fish production. *Blackwell scientific*, Oxford. 75-101pp.

Coasta, H.H and Wanninayake, T.B. (1986). Food, feeding and fecundity of the giant fresh water prawn, *Macrobrachium rosenbergii* from a natural habitat in Sri Lanka. *The first Asian fisheries forum*, 555-558pp.

Cortes, E. (1999). Standardized diet compositions and trophic levels of sharks. ICES *Journal of Marine Science*, 56:707- 717.

Deekae, S.N and Idoniboye-Obu, T.I.E. (1995). Some aspects of commercially important molluscs and crabs of the Niger Delta, Nigeria. *Environmental Ecology*, 13(1): 136-142.

Hyslop, E. J. (1980). Stomach contents analysis: A review of methods and their applications. *Journal of Fisheries Biology*, 17: 411-429.

Jimoh, A. A., Clarke, E. O., Whenu, O.O and Adeoye, H.B. (2011). Food and feeding habits of the African river prawn (*Macrobrachium vollenhovenii*, Herklots, 1857) in Epe Lagoon, southwest Nigeria. *International Journal of Fisheries and Aquaculture*. 3(1) 10-15.

Marioghae, I. E. (1982). Note on the biology and distribution of *Macrobrachium vollenhovenii and Macrobrachium macrobrachion* in Lagos Lagoon (Crustacea Decapoda, Palaemonida). *Review of Zoological Africana*, 96 (30): 493-508.

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*, 53: 20pp.

New, M.B. (2002). Farming freshwater prawns: A manual for the culture of the giant river prawn, (*Macrobrachium rosenbergii*). Food and Agricultural Organization, Fisheries *Technical Paper*, 428:212pp.

Nwosu, F. (2007). The Problem of By Catch Associated with Industrial Shrimping: Implications for Inshore Demersal Fisheries in the Niger Delta. In Small Scale Shrimp Fisheries in Nigeria. Edited by O. Z. Abbey. Centre for Environment, Human Rights and Rural Development (CEHRD), Eleme, Rivers State, *CEHRD/TECH/CONSERV/01/2007*, 32-48pp.
Ricker, W. E. (1971). *Methods of assessment of fish production in freshwater*. 2nd edition. Blackwell scientific publications, London, 35pp.
Roy, D and Singh, S.R. (1997). The food and feeding habits of a freshwater prawn *Macrobrachium choprai*. *Asian Fish Science*, 10: 51 – 63.
Sharma, S and Subba, B.R. (2005). General biology of freshwater prawn, *Macrobrachium lamarrei (*H. Milne-Edwards) of Biratnagar, Nepal. *Our Nation*, 3: 31 – 41.
Udo, P. J and Ekpe, E. D. (1991). Fecundity in the African river prawn, *Macrobrachium vollenhovenii* (Herklolts, 1957) from natural habitats. *Journal of Tropical Aquaculture*, 6(2): 173-177.
Umoh, I. B and Bassir, O. (1977). Lesser known sources of protein in some Nigerian peasant diets. *Food Chemical*, 2: 315-329.
Wootton, R. J. (1992). *Fish Ecology*: Tertiary Level Biology. Blackie, London, 212pp.

Table 1. Analysis of stomach content of *Macrobrachium macrobrachion* in Great Kwa River, Obufa Esuk Beach, Cross River State, Nigeria.

Food item	**Frequency Number**	**Occurrence Method (%)**	**Numerical Number**	**Numerical Method (%)**
Baterplankton	60	4.47	247	7
Detritus	263	19.58	-	-
Diatom	231	17.80	-	-
Fibres	15	1.12	309	9
Fish bone	104	7.74	531	15.1
Flagellate	75	5.58	167	5
Insect part	101	7.52	643	18.3
Microcystis	48	3.57	268	8
Mud particle	146	10.90	-	-
Palm remains	23	1.71	408	12
Poly worms	29	2.16	426	12
Sand grain	129	9.61	-	-
Unidentified algae	87	6.47	-	-
Unidentified invertebrate	10	0.74	158	5
Zooplankton	22	1.64	350	10

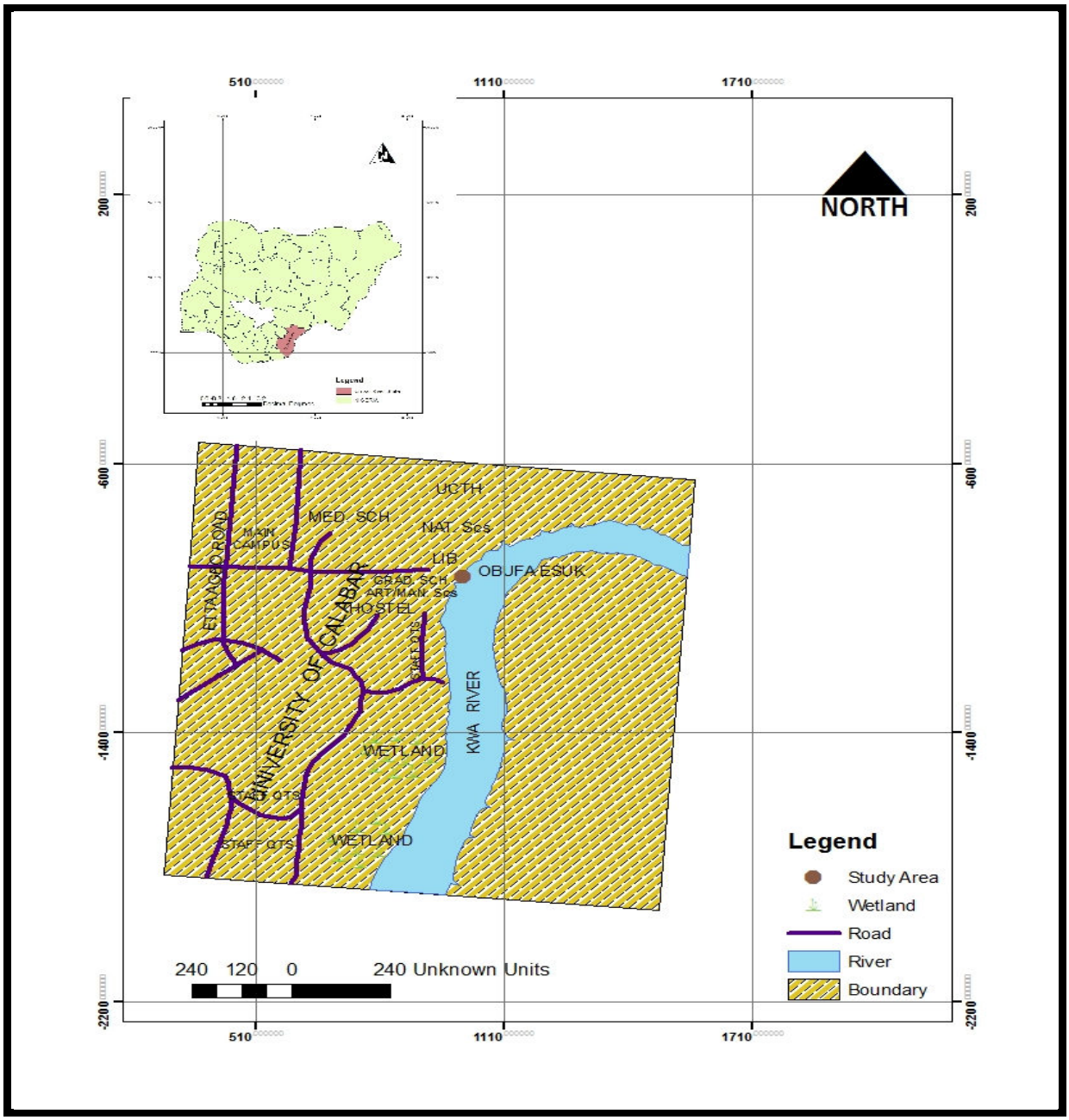

Figure 1. Map of University of Calabar showing Great Kwa River and Sampling Station (Obufa Esuk Beach), (Map of Nigeria indicating Cross River State).

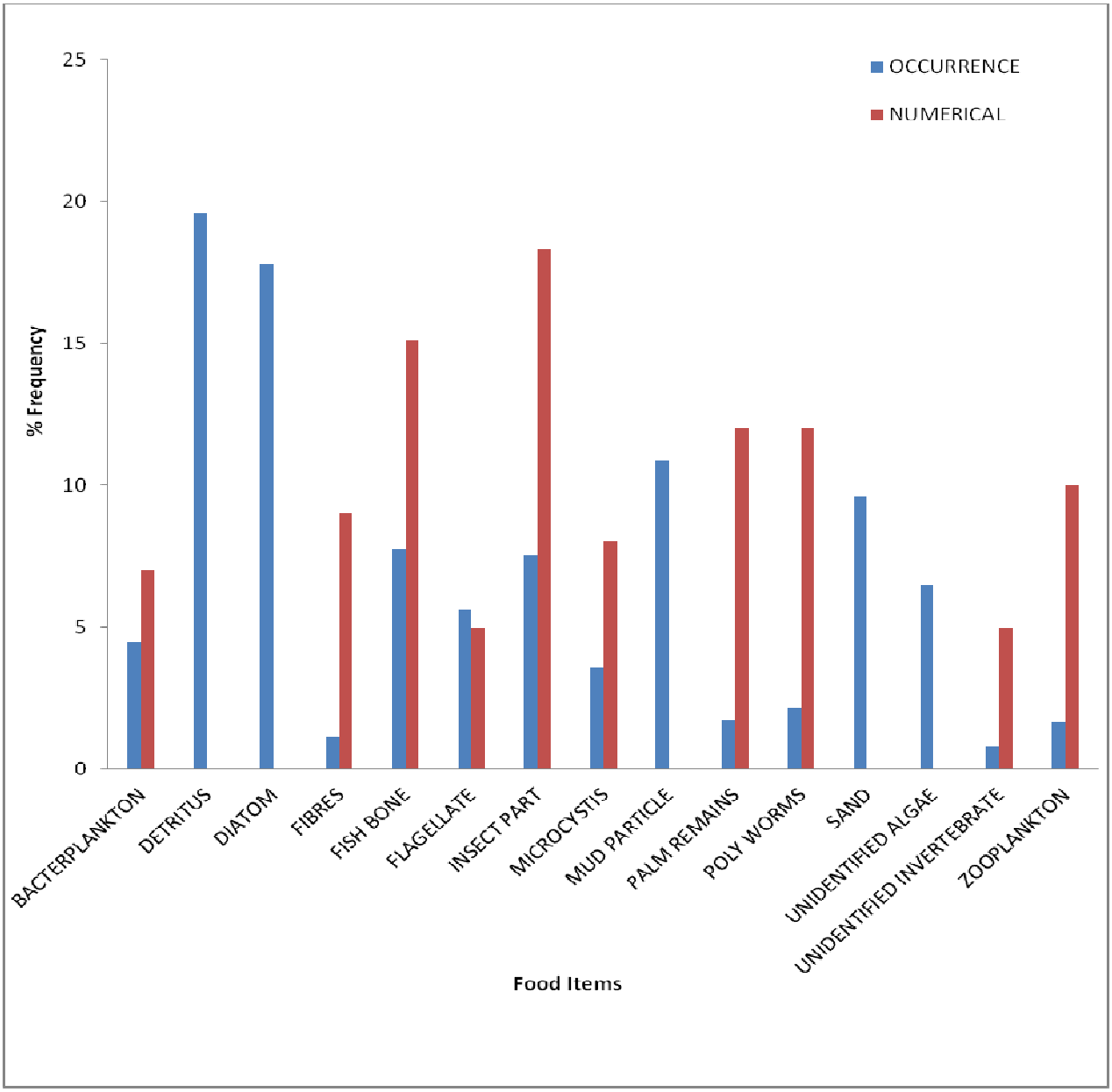

Figure 2. Distribution of stomach content of *Macrobrachium macrobrachion* from Great Kwa River, Obufa Esuk Beach, Cross River State, Nigeria.