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FOOD HABITS, SEXUAL DIMORPHISM AND SEX RATIO OF THREE PALAEMONID PRAWNS OF THE NUN RIVER, NIGER DELTA, NIGERIA

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ABSTRACT

*The food habits, sex ratio and differences of three freshwater prawns – *Macrobrachium vollenhovenii*, *M. macrobrachion* and *M. felicinum* from Nun River, Niger Delta were studied. It was found that although the prawns had an omnivorous diet feeding on a wide range of organisms including plants, detritus, insect parts, phytoplankton and zooplankton the food habits indicate a tendency towards a plant-based (herbivorous) diet. The adult prawns exhibit sexual dimorphism with males being larger than females; however the males were fewer in number than the females with mean ratios of 1:2.79, 1:1.58 and 1:9.12 for *M. vollenhovenii*, *M. macrobrachion* and *M. felicinum*. Sexual dimorphism exists in the species and brood-stock are available in the Nun River system of the Niger Delta region.*

Keywords: freshwater prawn, *Macrobrachium*, omnivore, aquaculture candidate, gut content.

INTRODUCTION

The fresh water prawns have been described as the most recent entrant candidate species for aquaculture, with the genus *Macrobrachium* being the most

visible (New 2002). In Nigeria however, the culture of prawns is still at the rudimentary stage with a need for baseline data for the development of culture techniques for this group of organisms. Several species of *Macrobrachium* occur in both fresh and brackish water habitats in Nigeria (Powell, 1983). Three prawn species most desirable for aquaculture are *M. vollenhovenii*, *M. macrobrachion* and *M. felicinum*; the first two being the largest species of the genus occurring in Nigerian waters. Knowledge of natural food habits of species is a requirement for the development of compounded feeds for proper nutrition of cultured organisms (Ugwumba and Ugwumba, 2007).

Breeding programmes for production of seed for farmers require a ready stock of both male and female breeders. Knowledge of the source of breeders and their identification is relevant for hatchery producers as well as abundance ratios (male:female) to be adopted for success of breeding programmes (Hart *et al* 2003).

Therefore, this study was carried out to provide baseline information on the food habits, sexual dimorphism and sex ratio of three freshwater prawn species of the family Palaemonidae from the Nun River system, Niger Delta, Nigeria.

MATERIALS AND METHODS

Sampling

Adult specimens of *Macrobrachium felicinum*, *M. vollenhovenii* and *M. macrobrachion* used for this study were obtained from prawn fisher folk (women) of the Nun River at Tombia, Bayelsa State. The prawns were caught with funnel-mouthed non-return valve traps and were

preserved in 10% buffered formalin in high density polyethylene containers. The prawns were then transported to the laboratory of the African Regional Aquaculture Centre, Aluu, Port Harcourt, Rivers State.

Identification of Species

In the laboratory, the specimens were identified and sorted into the different species using the taxonomic key by Powell, 1983.

Morphometric Measurements

The total length (TL) in millimetres (mm) of specimens was determined using a pair of Vernier Callipers (Manostat model), corresponding weight in grammes (g) was also measured using Sartorius balance Model 310s.

Determination of Sexes and Sex Ratio

The specimens were examined visually to determine any distinguishing morphological and secondary sexual characteristics. Number of females and males for each species were then counted and values obtained were used in calculating the sex ratio.

Gut Content Analysis

Gut content of 396 specimens of *M. felicinum*; 127 specimens of *M. vollenhovenii* and 117 specimens of *M. macrobrachion* were analysed. The procedure involved removal of carapace to expose the gut which was then drawn out with dissecting needle. The gut was then slit open using a blade and the entire contents placed on a slide to which a drop of water was added. The slide was then viewed under an Olympus light microscope at x10, x40 and x100 magnification. Organisms were then identified using appropriate taxonomic keys (Durand and Leveque, 1980; Durand and Leveque, 1981; Han, 1983). The frequency of occurrence method as reviewed by Hynes (1950) was used in the analysis of the gut contents.

RESULTS AND DISCUSSION

Food Habits

The guts of the three palaemonid prawns studied contained a wide variety of food organisms ranging from plant material to detritus, plankton and insect parts (see Table 1). The values obtained indicated that detritus and plant materials were the major food of the palaemonid prawns occurring more frequently in stomachs of the three species of prawns. Zooplankton occurred in guts of *M. felicinum* and *M. vollenhovenii* at percentages of 3.54% and 9.45%; while insect parts were present at percentages of 4.29%, 7.09% and 1.71% respectively for *M. felicinum*, *M. vollenhovenii* and *M. macrobrachion*.

This is in slight contrast with reports by Marioghae and Ayinla (1995) indicating that *M. vollenhovenii* and *M. macrobrachion* are omnivorous detritivores with a strong preference for animal remains and a tendency to cannibalism. Detritus was encountered in 67.17%, 44.88% and 8.55% of guts examined in *M. felicinum*, *M. vollenhovenii* and *M. macrobrachion*. While plant materials occurred at a percentage of 47.7%, 38.58% and 10.26% respectively. Phytoplankton formed the third major food of the prawns occurring in guts of the prawns at percentages of 32.32%, 10.24% and 1.71% for the three species *M. felicinum*, *M. vollenhovenii* and *M. macrobrachion*.

The prawns sparsely fed on zooplankton and insect parts and these food items were least encountered. The palaemonid prawns fed on a wide variety of phytoplankton belonging to different taxonomic groups namely Cyanophyta (blue-greens), Chlorophyta (greens), Bacillariophyta (diatoms), and Euglenophyta (flagellates) while zooplankton comprised mainly cladocerans, copepods and protozoa (Table 3).

Sexual Dimorphism

It was observed that the walking legs (periopods) of the males in the three species are set close together in nearly parallel lines with a little gap between them; however in females a wide gap exists between the last pair of periopods. This characteristic is in consonance with reports for *M. rosenbergii* (D'abramo *et al.*, 1995). This feature can be used in distinguishing immature males or females that have lost their chelae from females. Besides this feature, males are reportedly larger than females (Deekae, 1981; New, 2002; Hart *et al.*, 2003) and have very large second pair of walking legs ending in well formed chelae (Powell, 1983).

Results of higher number of females than males was also reported for pond reared *M. felicinum* with sex ratio of 1:21 (Hart *et al.*, 2003). However numbers varied from the specimens caught from Nun River in the present study.

Sex Ratio

The three palaemonid prawn species from Nun River studied showed inequality with a higher number of females than males in the sampled population. In this study, mean sex (male: female) ratio for *M. felicinum* was 1:9.12; for *M. vollenhovenii* 1:2.79; and for *M. macrobrachion* 1:1.58. Visible differences were observed in the sex ratios but there were no statistically significant differences of sex ratios between the species ($p > 0.05$). The higher number of females when compared to males appears to be a sign of the vulnerability of males during several moulting stages they need to undergo to attain their large size. Males grow larger than females and after every moult it appears their soft bodies are easier to be preyed upon by predatory aquatic animals; and so the number of males is reduced when compared to the adult females. Be it as it may most wild caught adult females are berried i.e. carrying fertilized eggs (Hart *et al.*, 2003) and so is an indication that the reduced male population is not a

deterrent to reproductive activities in the prawns.

CONCLUSION

The palaemonid prawns are omnivorous in nature being able to feed on a wide variety of organisms but tending towards a herbivorous diet. This is significant if the prawns are to be developed for aquaculture purposes, as the diet could be formulated using plant based products which would be cost-effective in feed production. The availability of both adult male and female prawns in the Nun River indicates the location as a ready source of brood-stock for those intending to embark on breeding programs.

REFERENCES

- D'abramo, L.R., Daniels, W.H., Fondren, M.W., Bruson, M.W. (1995). Management practices for the culture of the freshwater prawn (*Macrobrachium rosenbergii*) in temperate climates. MAFES Bulletin 1030: 12pp.
- Deekae, S.N. (1981). The sex ratio and fecundity of palaemonid shrimps (*Palaemon maculatus* and *Palaemon africanus*) in Rivers State. B.Sc. Dissertation, University of Port Harcourt.
- Durand J. -R. and Leveque, C. (1980). Flore et faune aquatiques de l'Afrique Sahelo-Sudaniennne. Tome I. Editions de l'Office de al Recherche Scientifique et Technique Outre-Mer (O.R.S.T.O.M.) Collection Initiations - Documentations Techniques n° 44. Paris, 389p.
- Durand J. -R. and Leveque, C. (1981). Flore et faune aquatiques de l'Afrique Sahelo-Sudaniennne. Tome II. Editions de l'Office de al Recherche Scientifique et Technique Outre-Mer (O.R.S.T.O.M.) Collection Initiations - Documentations Techniques n° 45. Paris, p 390-873.

- Egborge, A.B.M. (1993). Biodiversity of aquatic fauna of Nigeria. Natural Resources Conservation Council, Abuja. 173p.
- Han, M. (1983). Illustration of freshwater plankton. Agricultural Press, China. 171p
- Hart, A.I., Ansa, E.J., Sekibo, I. (2003). Sex ratio, sexual dimorphism and fecundity of pond reared Niger River prawn, *Macrobrachium felicinum* (Holthuis, 1945). *The Zoologist*. Vol 2 (1): 56-61.
- Hynes, H.B.N. (1950). The food of freshwater sticklebacks, (*Gasterosteus aculeatus* and *Pygosteus pungitius*) with a review of the methods used in studies of food of fishes. *J. Anim. Ecol.* 19:36-58.
- Marioghae, I.E. and Ayinla, O.A (1995). The reproductive biology and culture of *Macrobrachium vollenhovenii* (Herklots, 1857) and *Macrobrachium macrobrachion* (Herklots 1851) in Nigeria. NIOMR Tech. Pap. No. 100.
- New, M.B (2002). Farming freshwater prawns, a manual for the culture of the giant river prawn (*Macrobrachium rosenbergii*), FAO Fisheries Technical Paper No. 428. 212p.
- Powell, C.B. (1983). Fresh and brackish water shrimps of economic importance in the Niger Delta. In: Proceedings of the 2nd Annual Conference of the Fisheries Society of Nigeria (FISON). p254 – 285.
- Ugwumba, A.A.A., Ugwumba, O.A. (2007). Food and feeding ecology of fishes in Nigeria. Crystal Publishers, Lagos. 91p

Table 1: Occurrence of Different Foods Types in Guts of Three Palaemonid Prawns from Nun River, Niger Delta

S/No	Species	No. of stomachs examined	FOOD TYPES									
			Plant material		Detritus		Insect Parts		Phyto-plankton		Zoo-plankton	
			No.	%	No.	%	No.	%	No.	%	No.	%
1	<i>Macrobrachium felicinum</i>	396	189	47.73	266	67.17	17	4.29	12.8	32.32	14	3.54
2	<i>Macrobrachium vollenhovenii</i>	127	49	38.58	57	44.88	9	7.09	13	10.24	12	9.45
3	<i>Macrobrachium macrobrachion</i>	117	12	10.26	10	8.55	2	1.71	2	1.71	-	-

Table 2: Phytoplankton Composition Occurring in Guts of *Macrobrachium felicinum*, *M. vollenhovenii* and *M. macrobrachion* in Nun River, Niger Delta

S/No	Taxonomic Group	Genera
1	Cyanophyta	<i>Radiococcus</i> , <i>Anabaenopsis</i> <i>Phormidium</i> , <i>Rivularia</i> <i>Merismopedia</i> , <i>Lyngbya</i> <i>Gleotrichia</i> , <i>Microcystis</i> <i>Aphanizomenon</i> , <i>Rhabdoderima</i> <i>Metrismoelia</i> , <i>Gloeocapsa</i> <i>Spirulina</i> , <i>Oscillatoria</i> <i>Dactylococcopsis</i> , <i>Aphanothece</i> <i>Coelosphaerium</i> , <i>Gomphosphaerium</i> <i>Nostoc</i> , <i>Anabaena</i> , <i>Raphidiopsis</i>
2	Chlorophyta	<i>Closterium</i> , <i>Euastrum</i> <i>Cosmarium</i> , <i>Volvox</i> <i>Shroederia</i> , <i>Chlorogonium</i> <i>Quadrigula</i> , <i>Treubaria</i> <i>Pleurotaenium</i> , <i>Scenedesmus</i> <i>Ankistrodesmus</i> , <i>Nephrocytium</i> <i>Kirchneriella</i> , <i>Closteriopsis</i>
3	Euglenophyta	<i>Trachelomonas</i>
4	Bacillariophyta	<i>Tabellaria</i> , <i>Cocconeis</i> <i>Sunetra</i> , <i>Achnanthes</i> , <i>Surirella</i>

Table 3: Zooplankton Composition Occurring in Guts of *Macrobrachium felicinum*, *M. vollenhovenii*, and *M. macrobrachion* in Nun River, Niger Delta

S/No	Taxonomic Group	Genera
1	Protozoa	<i>Lacrymaria</i> , <i>Marituja</i> , <i>Urocentrum</i> <i>Strombidinopsis</i> , <i>Stentor</i> <i>Diffugia</i> , <i>Holophyra</i> <i>Chilodonella</i> , <i>Prorodon</i> <i>Condy/ostoma</i> , <i>Frontonia</i> <i>Bursella</i> , <i>Tintinopsis</i>
2	Copepoda	<i>Acanthocyclops</i> , <i>Mesocyclops</i> <i>Sinocalanus</i> , <i>Heterocope</i>
3	Cladocera	<i>Alonella</i> , <i>Pleuroxus</i> , <i>Leydigia</i>