J. Basic. Appl. Sci. Res., 1(9)998-1005, 2011

ISSN 2090-424X
Journal of Basic and Applied Scientific Research
www.textroad.com

Diet Composition, Length/Weight Relationship and Condition Factor of *Hyperopisus bebe occidentalis* (Lacepede 1803) Caught in Warri River

Olele, N. F.

Fisheries Department, Delta State University, Asaba Campus Nigeria.

ABSTRACT

A total number of 202 specimens, comprising 75 females and 127 males of *Hyperopisus bebe occidentalis* were caught from Warri River. This gave a proportion of 1:1.7 female to male sex ratio. The total length range for male specimens was 189.2 to 355.0 mm and for females, it was 246.0 to 376.1 mm. The body weight range of the specimens was 51.0 to 448.0 g for males and 106.0 to 400.0 g for females. The length weight relationship revealed a significant difference ($P<0.05$) for the male and female specimens thus: 'r' = 0.77 for male and 'r' = 0.51 for females. The slope of the regression for males (2.68) and females (1.76) was less than 3 which implied that the fish increased more in length than in body weight. The condition index was more favorable to male (4.64) than female (4.14) specimens based on mean values calculated on fresh and gutted body weights.

KEY WORDS: Warri River, specimen, condition index, tasty flesh and juvenile.

INTRODUCTION

Hyperopisus bebe, of the family Mormyridae, was formally under the genus *Mormyrops* (Malami et al., 2002 and Olaosebikan, 2004). They are well distributed in swamps, lakes and rivers of most Nigerian fresh water bodies (Ogbeibu and Ezeunara 2005; Idodo-Umeh, 2003; Malami et al., 2002/2004; Babatunde and Aminu, 2004) where they are far more abundant than other mormyrids. They were consumed for their oily tasty flesh.

Various researchers (Kauamelan et al., 2002; Nwani et al., 2004 and Malami et al., 2004) reported higher occurrence of plant materials in juvenile than adult specimens, although food items of plant and animal origin were consumed indiscriminately during periods of unavailability of their preferred food items. In Anambra River, the same species consumed benthos and allocthonous invertebrates with little amount of mud (Malami et al., 2004 and Nwani et al., 2006).

Food and feeding habits enables the farmer have clear understanding of fish dietary requirements with a view to providing/improvising feeds for them in aquaculture (Malami et al., 2004). Sufficient food intake aids optimal growth, resulting in production increases and subsequent economic benefits. Pius and Benedita (2002) reported the use of gut content for reducing intra and inter specific competition of fish in the ecosystem. From the review of literature, it was observed that the food and feeding habit of *Hyperopisus bebe* harvested from the Warri River was lacking. The present study therefore investigated the diet composition, length/weight relationship and condition factor of this commercially important fish species harvested from Warri River.

MATERIALS AND METHODS

Warri River is one of the most important coastal rivers of the Niger-Delta region. It takes its source about 10 km away from Utagba-Uno which lies North and East of the Equator within latitude $6^0\ 0^1$ N and longitude $5^0\ 2^1$ E (Fig 1). It covers a surface area of 255 km^2 with a length of about 150 km^2 (Olomukoro and Egborge, 2004).

Fish Sampling

Fish sampling was conducted on monthly bases, between April to September 2010, using cast nets, traps, fleets of nylon multifilament set gill nets of diverse mesh sizes and other traditional fishing gears, in the morning on each sampling day. Fishes harvested were injected with 5 % formalin (in the abdominal region) to stop food

***Corresponding Author:** Olele, N. F., Fisheries Department, Delta State University, Asaba Campus Nigeria. P.O. Box 1110 Nigeria.GSM +2348062905921. E-mail: nfolele@gmail.Com.

digestion during transportation of specimens to the fisheries laboratory located at the Asaba Campus of the Delta State University, where gut content examination, was carried out.

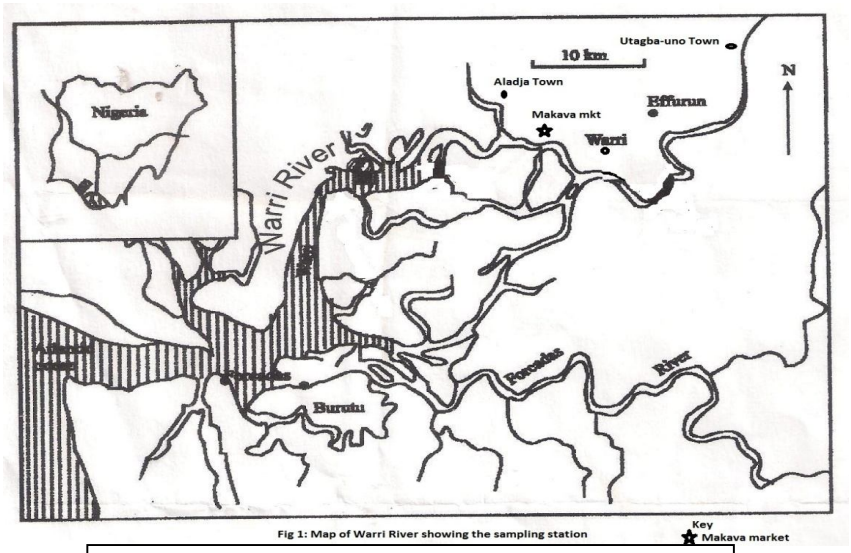

Fig 1 : Map of Warri River showing the study station

Length/weight measurements, food item identification and gut content analysis

Specimens were identified before sorting into male and female sex (Idodo-Umeh, 2003 and Nwani, 2004). Length and weight measurements were recorded to the nearest ± 0.01 mm and ± 0.1 g using the measuring board and triple beam balance OHAUS 210 Model, respectively. Length weight relationship was calculated thus: $W = aL^b$. Since the bodyweight increased more rapidly than total length, the formula was logarithmically transformed for the purpose of data analysis according to (Nwani et al., 2006 and Erhijowvho, 2007) thus: Log W = Log a + b Log L. Where 'a' was the proportionality constant, 'W' was the weight of fish in grams (g), 'L' was the total length of fish in millimeters (mm) and '*b*' was the allometric growth coefficient.

Guts were opened surgically, and weighed with and without food Gut contents were dispensed in sterile Petri-dishes to enable their observation under the microscope. Food items in those guts that could not be identified or analyzed immediately were stored in labeled vials containing 1% formalin for future examination. Large food items were easily recognized with the naked eyes, while microscopic ones were teased to disperse their aggregates, on a cleaned slide. They were examined under a Binocular Microscope, connected to the photomicrograph, to enhance proper viewing of food organisms during magnification (at X 1000) and identification. All recognized food items were identified (according to Kadiri, 1987 and Kadiri, 2002). Food items were analyzed using three methods of analysis of gut content as described below.

Frequency of occurrence method

The number of guts in which each food item occurred were listed and expressed as a percentage of the total number of guts examined. The fish population that fed on a particular food item was estimated (Odun and Anuta 2001; Inyang and Nwani, 2004).

Numerical method

The total number of each food item in each gut was summed up for all guts and expressed as a percentage of the total number of all food items (Odun and Anuta, 2001; Inyang and Nwani, 2004).

Point method

One hundred points was shared amongst the food items present in each gut according to their sizes, and expressed in percentage (Inyang and Nwani, 2004).

Condition factor

The condition factor (K) otherwise known as the wellbeing of the fish was calculated according to Erhijivwo, (2007) thus: $K = 100W/L^3$. Where K = Condition factor, L = Standard length of fish in mm, and W = Body weight of fish in grams.

Feeding intensity

Feeding intensity of each specimen was calculated from the expression:

$$\text{Feeding intensity} = \frac{\text{Gut weight}}{\text{Body weight}} \times \frac{100}{1}$$

RESULT

Fish population, sex proportions and length-weight relationship of specimens

Two hundred and two (202) specimens, comprising 127 males and 75 females were examined. An over all proportion of 1**:**1.7 female to male sex ratio was obtained. Monthly sex ratio data, together with their means, total lengths and mean body weights are shown in table 1.

Table 1: Mean values for total length and body weight of *Hyperopisus bebe*.

Month	Sample size: Male	T_L (mm)	B_W (g)	Sample size: Female	T_L (mm)	B_W (g)	Sex. Ratio
April	19	279.0	210.0	0	281.0	210.0	1:0
May	25	274.4	163.0	3	280.0	165.0	8.3:1
June	15	313.0	262.0	18	302.7	249.0	1:12
July	20	292.0	187.0	20	312.3	276.0	1:1
August	27	288.7	177.0	13	293.8	176.0	2:1
September	20	285.7	191.0	20	288.5	209.0	1:1
Total	127			75			1:1.7

T_L = Mean total length and B_W = mean body weight etc.

Total length ranged between 189.00 – 379.0 mm, while body weights varied from 50.0 – 499.0 g. The male specimens exhibited the highest and lowest total length frequencies (300.00 – 309.00 mm) and (180.00 – 189.00 mm) respectively, Fig 2.

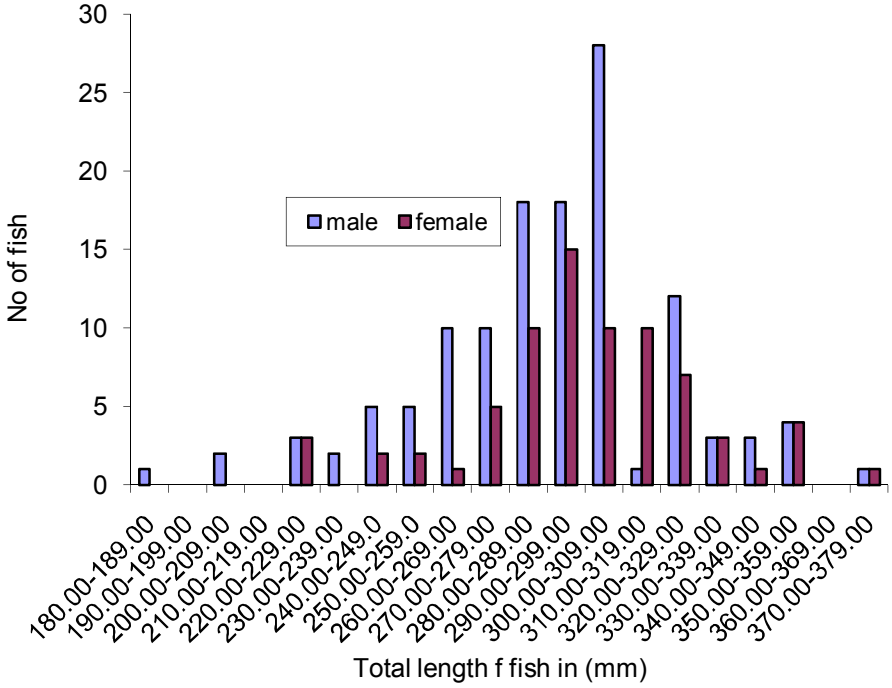

Fig 2: Length frequency histogram of male and female specimens of *H. bebe*

Again, the male specimens, at a weight range of (200 - 249 g) had the highest frequency (37) while at a weight range of (400 - 449 g) only one specimen was encountered. For female specimens, the highest and lowest body weight ranges of (150-159) and (350-399) had frequencies of (23) and (1) respectively, Fig 3.

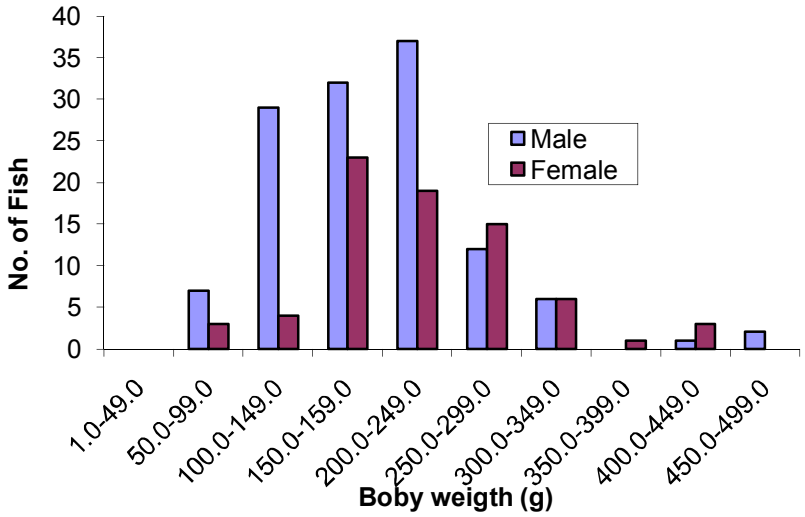

Fig 3: Body weight frequency histogram showing male and female distributions.

Features of *H. bebe* involving body weight and total length increment was described by the correlation co-efficient relationship transformed into log and expressed as log W = aL^b where 'r' value for males was 0.77 (Fig 4) and that for females was 0.51 (Fig 5). Both values were statistically significant at $p<0.05$. The '*b*' value for male (2.68) was higher than that for female (1.76) although both values revealed negative allometric growth, because their values were less than 3.

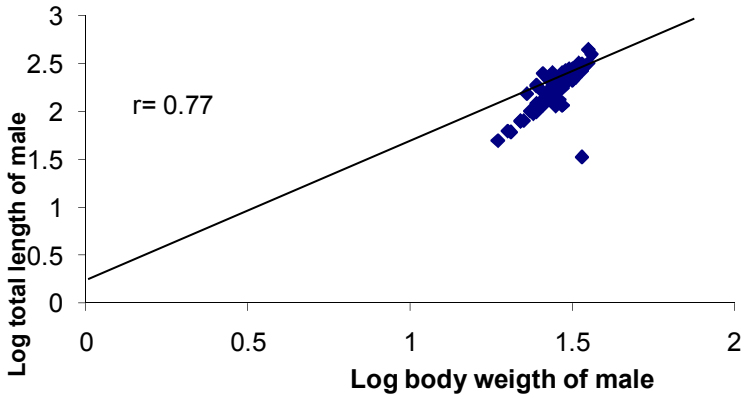

Fig 4: Log relationship between total length and body weight of male of *H. bebe*

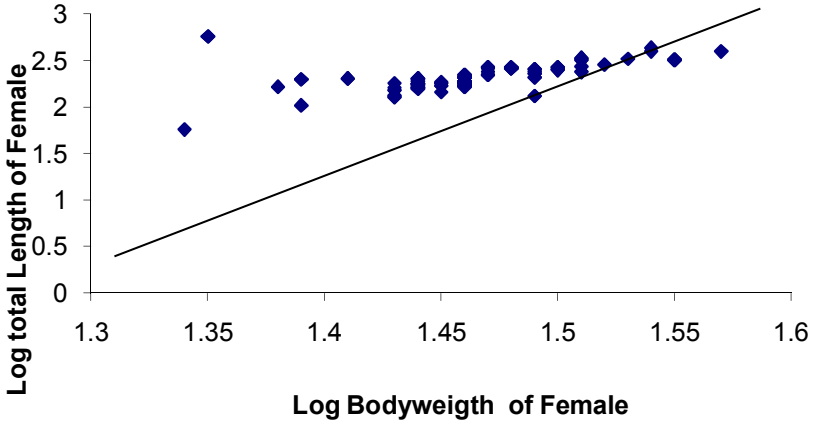

Fig 5: Log relationship between total length and body weight of female of *H. bebe*

Condition factor

Table 2 revealed that male specimens (4.64) were in a better condition than the female specimens (4.14) based on their mean values calculated for fresh and gutted body weights.

Table 2: Mean condition factor for fresh and gutted body weights of *H. bebe*

Sex	No of specimen	Mean k for fresh body weight	Mean k for gutted body weight
Male	127	0.87	4.64
Female	75	0.68	4.14
Male + Female	202	1.55	8.78

K = Condition factor

Gut fullness, food items analyzes and seasonal variation in feeding habits

It was observed that out of the 202 specimens used for the study, only four (4) had empty guts, accounting for 1.9 %; 24 specimen had full guts (11.9%); 87 specimen had half-full guts (43.1%); 46 specimen had three quarter full guts (22.8%), while 41 specimens had quarter-full guts accounting for (20.3%).

Table 3: Shows three methods of analysis of gut content during the study period.

Food items	Numerical method.		Frequency of occurrence.		Point method.	
	No	%	No	%	No	%
BACILLARIOPHYTA: *Navicula* spp	182	8.5	103	7.9	120	8.5
***Ulothrix* spp**	159	7.4	118	9.1	120	8.5
***Tabellaria* spp**	144	6.7	77	5.9	101	7.1
***Coscinodiscus* spp**	6	0.2	6	0.5	15	1.0
Total	**491**	**22.8**	**304**	**23.4**	**356**	**25.1**
CHLOROPHYTA: *Closterium* spp	116	5.4	78	6.0	55	3.9
***Cosmarium* spp**	63	2.9	42	3.2	30	2.1
***Spirogyra* spp**	46	2.1	34	2.6	21	1.5
Total	**225**	**10.4**	**144**	**11.8**	**106**	**7.5**
DINOFLAGELLATES: *Gomyaulax* spp	185	8.6	114	8.8	125	8.8
***Ceratium* spp**	27	1.3	23	1.8	50	3.5
***Merismopedia* spp**	136	6.3	88	6.8	115	8.1
Total	**348**	**16.2**	**225**	**17.4**	**290**	**20.4**
CRUSTACEANS: Shrimp parts	10	0.5	9	0.7	21	1.5
Crayfish parts	71	3.3	42	3.2	70	4.9
Total	**81**	**3.8**	**51**	**3.9**	**91**	**6.4**
Chironomid larva	186	8.6	113	8.7	65	4.6
COLEOPTERA: Whole beetle	100	4.6	71	5.5	70	4.9
Beetle parts	94	4.4	38	2.9	58	4.1
Total	**194**	**9.0**	**109**	**6.4**	**128**	**9.0**
INSECTS: Whole parts	15	0.7	9	0.7	25	1.8
Root hairs	179	8.3	96	7.4	120	8.5
Sand and stone	146	6.8	51	3.9	44	3.1
Seed grains	141	6.6	68	5.4	98	6.9
Unidentified	145	6.7	117	9.0	95	6.7
Grand total	**2,151**	**100**	**1297**	**100**	**1,418**	**100**

The three methods used for analysis of food items in the guts revealed that the most dominant food item identified was from the Bacillariophyta family. This family contributed (22.8 %) by numerical method and 23.4 % by frequency of occurrence method. Dinoflagellate contributed (16.2 %), by the numerical method and (20.4 %) by the point method. Chlorophyta contributed (10.4 %), by numerical method, while insects parts which was the least dominant food item, contributed the least food items (0.7 %) by numerical and frequency of occurrence methods, Table 3. There was no seasonality in the composition/abundance of food items consumed generally, because fish specimens grazed on the same food items throughout the sampling period although to varying quantities/degrees.

This study revealed that each gut was generally full during the study period. Fuller guts predominated during the months of April, May and June when the species fed more on algae, seed grains and food items of the Bacillariopyta family. Specimens equally fed on dinoflagellates and root hairs within the months of July, August and September. There was size rather than sex dependent, variations in diet consumptions. This observation suggested that the plasticity in food composition/abundance exhibited by both sexes of this species, enabled them to exploit varieties of food items, thus maintaining their distribution in all their habitats.

DISCUSSION

Size frequency distribution: The size frequency distribution of the specimens revealed different weight, age and size classes in the population. Previous studies have shown that there exist varieties in food and feeding habits of fishes according to their weight, age and size, (Omorinkoba and Fatuiti 2009). Understanding the relationship between body structures and fish diet was important for predicting fish diet and their mechanisms of feeding. Hence the type of food found in an area influenced the distribution, abundance and rate of growth (size) of the fish (Ogheneochuko, 2007).

Sex ratio: Male specimens appeared to be more populated than the female, showing an imbalance sex ratio. This situation may have resulted from the fact that the females migrated to deeper waters for spawning purposes during certain months of the year as confirmed by (Nwani, 2004).

Length weight relationship: There was a significant correlation between body weight and total length of specimens in this study, showing that increase in length resulted in corresponding increase in weight. This assertion was supported by Nwani et al., (2006). According to Olurin, (2006), differences in length and weight results from differences in sex and developmental stages of the fish. Aliakbar & Ali (1978) and Kunda (2008) are of the view that the fluctuations obtained in certain length groups might be due to variation in sample size, sex, gonad condition and fullness of gut content. Length–weight relationship was important for the estimation of weight where length data are available and as a condition index of fauna (Haimovici and Velasco, 2000). Length-weight relationship was also useful in estimating standing stock biomass and densities of various fauna in the aquatic habitat.

Specimen used for this study exhibited negative allometrric growth because their values were less than 3. However, Olele and Obi (2004) reported positive allometric growth (3.1). Higher values than those observed in the present study was reported Arawomo (1981) (2.8) and (Baijot *et al*., 1997) (2.5-3.5). Such differences in values may have been influenced by sex, maturity stages, seasonality and the time of day food was eaten or when it becomes available to the fish as shown by fullness of gut content. Fagade and Adebisi (1979) reported that in cichlids, an increase in body weight was associated with increase in standard length. He reported '*b'* value of 2.9 and 3.4 for *Tilapia melanotheron* and *T. guinensis* respectively.

Condition factor: The condition factor of specimens based on fresh and gutted body weights (g) revealed that those for males were higher than those for females, showing that the former sex, fed better than the latter sex. This behavior encouraged better survival of male than female specimens, as was also observed by Nwani et al., (2004).

Analysis of food items: Food items identified were of plant and animal origins, suggesting that the fish was an omnivore. This assertion was supported by Malami et al., (2004). The variety of food organisms consumed by this species depended on their availability which also supports the works of Ogbeibu and Ezeunara (2005).

Fullness of gut content: The overall results of gut fullness revealed that two percent of guts were empty, while varied quantities of food items were found in ninety – eight (98%) percent of guts. The occurrence of higher non empty guts may have resulted from the immediate arrest of food digestion through the injection of formalin into the gut region of the fish before its conveyance to the laboratory after capture. This observation was in line with the report of (Malami et al, 2004) on same species. The greater number of guts with food was attributed to good feeding strategy adopted by the specimens (Haroon, 1998 and Nwani 2007) and probably due to food abundance during the season. The frequency of occurrence of food were higher in early dry and flood seasons. This may be attributed to food abundance during the season. The frequency of occurrence of food were higher in early dry and flood seasons, This may be attributed to food abundance during dry season and insect and grain/seed available in early rainy season. The present observation is supported by the works of Nwani (2004) who reported active feeding habit of *Hyperopisus bebe* in River Rima during dry and wet seasons. Kouamelan et al (1999 and 2002), investigated the food and feeding habits of *Mormyrus rume* in Bia river (Cote de' voir Ghana). Their reports showed that young *Mormyrus rume* feed more on Chironomid larvae and food from the Bacilliarophyta family while adult specimen feed more on all other food items.

Conclusion: *Hyperopisus bebe* belongs to the family mormyridae which is one of the largest groups of fishes. Their ability to feed on wide range of organisms at different trophic levels (food chain) was the possible reason for their fast growth, making them promising candidates for commercial culture. Since the species are widely accepted and used as human food throughout the area in which they occur, they could be easily incorporated into local poly-culture systems with minimal inputs of expensive animal protein in their diet. The mean condition factor (k) for gutted body weight was higher than mean condition (K) for fresh body weight.

Also full gut content was more in dry season due to abundance of grain/seed and insects available for consumption by the fish species.

REFERENCE

Aliakbar, M. and M.L. Ali. (1978). Length-weight relationship of *Macrobrachium rosen-bergii* (DeMan) of Dakatia River. *Bangladesh Journal of Aquaculture.* 1(1): 74-78.

Arawomo, G.A.O. (1981). The growth of *Heterotis niloticus* in Opa Reservoir, University of Ife. Proc. Of the 2nd Ann. Conf of the fisheries society of Nigeria. 34-41 pp.

Babatunde, D.O. and Aminu, R. (2004). Field guide to Nigerian fresh water fishes second Edition. 61 pp.

Baijot, E., Moreau, J. and Bouda Sana. (1997). Hydrobiologica aspects of fisheries in small reservoirs in sahel region. Technical Centre for Agricultural and rural co-operation ACP-Eu 200 pp.

Erhijivwo, C. A. (2007). Food and feeding habits *Heterotis noliticus* caught in Onah lake Asaba, Nigeria. B. Sc. Thesis Department of Animal science and fisheries Delta State University. Nigeria . pp 10 -13.

Fagade, S.O. and Adebisi, A.A. (1979). On the fecundity of *Chrysichthys nigrodigitatus* (Lacepede) in Asejire Dam, Oyo State, Nigeria. *Nigeria journal of natural science.* 1:127-131.

Hamoivici, M. and G. Velasco, (2000). Length-weight relationship of marine fishes from southern Brazil Naga, International center for living Aquatic Resources management. Quarterly 23: 19 -23.

Haroon, A.S. (1998). Diet and Feeding ecology of two species of *Barbodes gonionotus* and *Oreochromis species* in rice field in Bangladeh. Naga, the ICLARM Quarterly pp. 13 – 18.

Idodo-Umeh, G. (2003). Freshwater fisheries of Northern Nigeria. (Taxonomy, Ecological Notes, Diet and Utilization). ISBN 978-8052-01-0.

Iyang, W. M and Nwani, C. D., (2004). Food and Feeding habits of Distichodous (Osteichthyes Distichodontidae) in Anambra River *Journal of Biological Research and Technology.* vol 4: 34-43

Kadiri, M.O. (1987). Algea and primary productivity studies of Ikpoba Reservoir. Ph.D thesis. University of Benin, Benin City. 298 pp.

Kadiri, M.O. (2002). Periphyton of Ikpoba River in Benin City, Edo State. B.Sc thesis, University of Benin, Benin City. 45 pp

Kouamelan, P.E. Juegels, G.G. and Ollevier, F. (2002). Feeding habits of *Mormyrops anguiloides* (mormyridae) in lacustrine and riverine habitat of a West African basin cybium 24 (i) 69 – 79.

Kunda, M.; Dewan, S.; Uddin, M. J.; Karim, M.; Kabir, S. and Uddin, M. S. (2008). Length-Weight Relationship, Condition Factor and Relative Condition Factor of *Macrobrachium rosenbergii* in Rice Fields. *Asian Fisheries Science.* 21 (2008):451-456 451.

Malami, G.Z., Ipinjolu, J.K. Hassan, W.A. and Magawutu, F (2002). Food and feeding habits of freshwater mormyrid (*Hyperopisus bebe Occidentalis*, Gunther) in River Rimo and Goronyo Dam, Nigeria. FISON conference proceeding (2007). pp 120 -126.

Malami, G.Z., J.K. Ipinjolu, W.A.Hassan and Magawata, I. (2004). Feeding adaptations of ten fish species in river Rima. North Western Nigeria. A paper presented at the 2004 Annual conference of Zoological society of Nigeria held at institute of developmental research, Ahmadu Bello University Zaria. Pp 115.

Nwani, C.D. (2004). Aspects of the biology of mormyrids in Anambra River, Nigeria. Ph.D Thesis University of Nigeria Nsukka 194 pp.

Nwani, Christopher, Didigwu, Ezenwanji, Henry, Maduka. Godfrey, Egu, Effiong Joseph and Emmanuel Fame (2006). Length – weight relationship and condition factor of four mormyrid species of Anambra river. Department of applied Biology, Ebonyi state University PMB 53, Abakaliki, Ebonyi State, Nigeria – Fisheries Hydrobiology research unit, department of Zoology University of Nigeria Nsuka.

Odun, O. and Anuta, M. (2001). The food and feeding habits of Musansorgi (Boulenger) from Warri river, *Nigeria Journal of Aquatic Science.* 16 – 18 (21).

Ogbeibu, A. E. and P.U. Ezeunara (2005). Studies on the food composition and feeding pattern of fish communities in the Ikpoba river southern Nigeria. *Journal of Aquatic Sciences.* 20 (2): 117 -129.

Ogheneochuko, O.S. (2007). Food and feeding habits of *Parachanna obscura* in Anwai River. A tributary of River Niger in Asaba B.Sc. Thesis Delta state University, Department of Fisheries. 10 pp

Olaosebikan, B.D. and Raji, A. (1998). Field guide to Nigerian fresh water fisheries. Federal College of Freshwater Fisheries Technology, New Bussa Niger State, Nigeria. 106 pp.

Olele, N.F. and Obi A. (2004). Reproductive biology of *Citharinus citharus* in Onah Lake, Asaba. Delta State of Nigeria. *Tropical freshwater biology*. Vol 13, 119-129.

Olomukoro, J.O. and A.B.M. Egborge (2004). Hydrobiological Studies on Warri River, Nigeria part 11: Seasonal trend in the physiochemical limnology. Trophical freshwater Biology, 12/13 pp 9 -23. www.ajol.info.

Olurin, K.B. and Aderibigbe, O. A., (2006). Length-weight relationship and condition factor of pond reared juvenile *Oreochromis niloticus. World Journal of Zoology* (2):82 -85.

Omorinkoba, W.S. and Fatuiti, E.O. (2009). Food and feeding habits of *Heterotis niloticus*. Swim up advanced fry from the Kainji Freshwater Reservoir, *Nigeria Journal of Fisheries Science and Technology*. vol. (1) 89 – 92.

Pius, M.O. and Benedicta, O.O. (2002). Food and feeding inter-relationship. A preliminary indicator to the formulation of the feed of some Tilapia fishes. *Tropical Journal of Animal Science*. 5(1): 35 – 41.