The food and feeding habits of the Sompat grunt *Pomadasys jubelini* (Cuvier, 1830) in the New Calabar – Bonny River, Porthacourt, Rivers state, Nigeria

[1]Agbugui, M.O., [2]Deekae, S.N., [1]Oniye. S.J. and [1]Auta, J.

[1] Department of Biological Sciences, Ahmadu Bello University Zaria, Nigeria,
[2] Department of Fisheries and Aquatic Environment, Rivers State University of Science and Technology, Porthacourt, Nigeria
marianuseni@yahoo.com

Abstract: The food and feeding habits of the Sompat grunt *Pomadasys jubelini* (Cuvier, 1830) in the New Calabar – Bonny River, Porthacourt, Rivers state, Nigeria was investigated in other to identify the dietary items and feeding habits. The analyses of the stomach contents were carried out by the numeric, frequency of occurrence, points and gravimetric methods. The results showed that the dietary items were crabs – *Callinectes amnicola* (73.1%), fresh water shrimps - *Macrobrachium macrobrachion* (24.08%) which were the important primary food components whereas, fish species - *Scomberomosus tritor* (1.51%), *Sardinella maderensis* (0.69%) and *Ethmalosa fimbriata* (0.56%) were secondary items. *Littorina anguilifera* was considered as incidental food item (0.02%). The total amounts of dietary items were higher in the wet season (April to October) than in the dry season (November to March). Most of these preys were often intact in the stomachs of *P. jubelini* examined. This is an indication that it swallows its prey whole thus imposing maximum limit on its prey and it is also a non-piscivorous, macroscopic feeding fish. The information obtained from this stud will contribute to the knowledge of fish biology with particular reference to the food and feeding habits and useful for fishery management and aqua-cultural tendency.
[Agbugui, M.O., Deekae, S.N., Oniye. S.J. and Auta, J. **The food and feeding habits of the Sompat grunt *Pomadasys jubelini* (Cuvier, 1830) in the New Calabar – Bonny River, Porthacourt, Rivers state, Nigeria.** *Stem Cell* 2013;4(4):55-61] (ISSN 1545-4570). ISSN: 1945-4732 (online). http://www.sciencepub.net/stem. 8

Key words: Dietary items, feeding habits, New Calabar-Bonny River, *Pomadasys jubelini*, stomach content, Index of relative importance (IRI)

1. Introduction:

Pomadasys jubelini is a bottom feeder inhabiting most rivers, estuaries, coastal and brackish waters of Nigeria, North and other West African Rivers (Viveen *et al*., 1977 and Idodo-Umeh, 2003). They are also found in the Atlantic, Indian and Pacific Oceanic regions of the world and are distributed widely from the coastline to about 200m depth in the marine environment (Sikoki and Francis, 2007). Its catches are in large quantities and available throughout the year. Specimens weighing 32.4g – 600g and length of 32.10cm – 50.00 cm have been recorded in River Ase, River Andoni, Kianji Lake-Northern Nigeria (Idodo-Umeh 1987, FAO 1981a and Sikoki and Francis 2007). All the species recorded in the East Central Fishing Area (FAO 1981b) are regularly exploited by local artisanal fishers or taken as by-catch from inshore trawling operations. They are good food fishes consumed fresh or dried (Sikoki and Francis, 2007). The type of food consumed depends on the availability of food item in the environment (Lagler *et al*, 1978). It also depends on the physical adaptation of the fish in terms of gut length, nature and composition of digestive physiology, teeth and pharyngeal bone, body shape and behavior (Welcome, 2001) The size of fish, season, sex, temperature, habitat/locality, competition, preference/selectivity and time of day are also important factors (Ugwumba and Ugwumba, 2007). The type of dietary item that fish consume can only be known through investigatory studies on the food and feeding habits of fish. Dietary items and feeding habits of fish have been carried out by some researchers in the River-rine areas of Nigeria. Such of these are the study of *C. auratus* by Ikomi and Odum (1998), the diets of *P. pellucida* by Allison (2006), the food and feeding habits of *Sphyraena afra* by Chukwu *et al*., 2009 and Amakiri 2009 on *Chrysichthys furcatus.* There is paucity of information on the dietary items and feeding habit of *P. jubelini* in the New Calabar-Bonny River. The result of this study will help to provide knowledge of the dietary items and feeding habit of *P. jubelini* in the New Calabar-Bonny River by identifying the dietary items, their abundance and occurrence and seasonal variations which is necessary for fisheries management and adequate supply.

2. Materials and methods:

The study area is located at the upper limits of the New Calabar-Bonny River near Porthacourt metropolis. Rivers State, Nigeria. It is located between latitude 4°36’ and 4°55’N and longitude 6°45’ and

7°72'E. Three stations were selected along the river for the purpose of this study based on the salinity of the river as reported by Nedeco, (1961) and Deekae, (1993). The stations are station 1(Oligohaline), station 2 (Mesohaline) and station 3 (Polyhaline). Rain fall is heavy in the months of May- October and this reduces the salinity of the rivers. Fish species found in the river include the Mullets (Mugilidae), silver cat fish (*Chrysichthys* nigrodigitatus), sardines (*Sardinella maderensis*), *Synodontis spp*, the red snapper (*Lutjanus agennes*), the barracuda (*Sphyraena afra*), *Tilapia spp*, the sword fish, the bagrid cat fish (*Auchenoglanis spp*) and *Pomadasys jubelini* which is a highly commercial fish in the area. There are also various shrimps, crabs (Hermit crab), and oysters.

2.1. Collection of specimens and sampling:

P. jubelini were collected monthly from June 2011 to May 2013 (24) calendar months from the three stations from catch landings of fishermen using hooks, gill net, traps and calabashes. The fish were transported in an insulated box containing ice chips to the fisheries laboratory of Department of Fisheries and Aquatic environment, Rivers State University of Science and Technology, Porthacourt. Fish were identified using pictures, keys by Reed *et al*., (1967), FAO (1981), Idodo-Umeh (2003) and Sikoki and Francis, (2007).

2.2. Morphological parameters:

Measurement was taken for each fish, the length (standard length (cm) and total length (cm)) girth length (cm) and weight (g) of the fish was determined using a, measuring tape, a graduated ruler and an electronic scale QE – 400 respectively.

2.3. Assessment of Stomach Fullness and Content:

The abdomen of each fish was opened lengthwise, and the gastrointestinal tract (GIT) will be removed and placed in a Petri dish containing normal saline. The stomach fullness was estimated as described by Olatunde (1978). The criteria used for the estimation are described below in Table 1. For example, if the stomach fullness falls in between the basic scores on the table, points were awarded appropriately.

Table 1: Classification of Stomach Fullness

Stomach Size	Description		Points
Full stomach	The stomach bulges considerably with food	100	
¾ full stomach	The stomach is almost full not bulge		75
½ full stomach	Food occupies about 50% of the stomach volume	50	
¼ full stomach	Stomach wall very flabby, sometimes looked as empty		25
Empty stomach	No visible food in the stomach when dissected and examined under the microscope		0

The stomach content were emptied into a Petri dish containing little amount of water which loosen up the materials for easier identification and estimation of number of organisms whish are made under a monocular microscope. The contents were identified to species level and analyzed by the frequency of occurrence method (FO), ``points'' method (PO) gravimetric method and numerical method (NO) (Bagenal 1978). The total weight of the stomach content (prey) found whole in the stomach were also measured and recoded. The biomass contribution of each prey was expressed as a percentage of the biomass of food consumed by *P. jubelini.*

2.3.1. Frequency of occurrence method (FO):

In the frequency of occurrence method the individual food matter in the stomach were sorted and identified. The number of stomachs in which each food item occurred was expressed as a percentage of the total number of stomachs with food examined.

2.3.2 Points method (PO):

In ``points'' method, the food items in the opened stomach were broadly grouped into Insecta, Crustacea, Mollusca etc. Points were then awarded to the individual food item based on the respective sizes and abundance. The sum of the points given to the individual dietary items was equal to the points awarded to the stomach size earlier. Points obtained by each food item were summed up and scaled down to percentages to give relative composition of all the food items.

2.3.3. Gravimetric method:

The weight of the food items are measured and expressed as:

$$\text{Percentage weight of food item} = \frac{\text{Weight of the particular food item}}{\text{Total weight of all food items}} \times 100$$

2.3.4. Numerical method:

This method involves the counting the number of each food item present in the stomach of a fish and summing these numbers to obtain the total number of all food items found in the stomach. The number of each food item is them expressed as a percentage of the total number of all food items. It is usually expressed as

$$\text{Percentage number of a food item} = \frac{\text{Total number of a particular food item}}{\text{Total number of all food items}} \times 100$$

2.4. Importance of food index (IRI):

The importance of various food items were determined with the index of food importance following a method Ugwumba and Ugwumba (2007)

$$IRI = (C_n + C_w) X F \quad \ldots\ldots (1)$$

Where IRI = index of relative importance

C_n = percentage of numerical composition

C_w = percentage of gravimetric composition

F = percentage of frequency of occurrence

The dietary compositions for the species examined were expressed as percentages, that is

$$\% IRI = \frac{(C_n + C_w) X F}{\sum (IRI)} X 100$$

Food item with %IRI ≥ 3 are regarded as primary, ≥ 0.1 to <3 are secondary where as ≤ 0.1 are considered as incidental food items.

2.5. Prey – predator relationship:

The relationship between the total body length and total weight of *P. jubelini* and prey body weight was determined and described by the equation;

$Y_L = a + {}_b X_L$ (Ogari, 1988)

Where Y_L = Prey body weight (g), X_L = *P. jubelini* body length (cm) or body weight (g)

3.0. Results:

The stomachs of 411 *Pomadasys jubelini* were examined for food items consumed; 183 (44%) contained food items while 230 (56%) had empty stomachs. Identified food items include *Callinectes amnicola* (73.1%) and *Macrobrachium macrobrachion* (24.08%) are the important primary food components whereas, *Scomberomosus tritor* (1.51%), *Sardinella maderensis* (0.69%) and *Ethmalosa fimbriata* (0.56%) are secondary items. *Littorina anguilifera* was considered as incidental food item (0.02%)(Table 2). *Macrobrachium macrobrachion*, *Callinectes amnicola,* S*ardinella maderensis* and *Scomberomosus tritor* occurred regularly in the stomachs of the fish throughout the period of the study without regards or preference to sex and size of fish while *Ethmalosa fimbriata* and *Littorina anguilifera* were sparingly observed in the stomachs of the fish. However, the total amounts of food items were higher in the wet season (April to October) than in the dry season (November to March) (Table 2). There was no significant difference ($P > 0.05$) in the quantities of food observed between the wet season and dry season. The relationship between the body length and prey body weight of *P. jubelini* is shown on Figure 1 and 2. The graph indicates a general body increase in prey size with increase in the length and weight of the fish. The positive relationship obtained was described by the linear equation $Y_L = a + {}_b X_L$

Table 2. Analyses of food composition consumed by *Pomadasys jubelini* (showing seasonal variation of dietary items)

Months	Food species							
2011	*Ethmalosa fimbriata*	*Sardinella maderensis*	*Scombe-romosus tritor*	*M. macro-brachion*	*Callinectes amnicola*	*Littorina anguilifera*	*Total*	*%*
June	0	9	0	5	11	0	25	10.0
July	2	5	3	2	8	0	20	8.0
August	0	3	0	5	4	0	12	4.8
Sep	0	3	1	2	2	0	8	3.2
Oct	0	2	1	3	2	0	8	3.2
Nov	0	3	0	3	5	0	11	4.4
Dec	0	0	0	0	0	0	0	0.0
2012								
Jan	0	2	0	0	5	0	7	2.8
Feb	0	0	0	1	3	0	4	1.6
Mar	0	0	0	1	2	0	3	1.2
Apr	1	3	1	5	4	0	14	5.6
May	2	2	2	3	1	2	12	4.8
June	2	3	0	5	13	0	23	9.2
July	0	0	2	0	12	0	14	5.6
August	0	0	0	6	13	0	19	7.6
Sept.	1	1	1	4	5	1	13	5.2
Oct.	1	2	2	1	5	0	11	4.4
Nov.	1	1	0	5	5	0	12	4.8
Dec.	0	0	0	1	0	0	1	0.4
2013								0.0
Jan.	0	0	0	1	0	0	1	0.4
Feb.	1	0	0	2	2	0	5	2.0
Mar.	0	0	0	0	2	0	2	0.8
April	0	0	1	5	1	0	7	2.8
May	0	1	1	6	11	0	19	7.6
Total	11	40	15	66	116	3	251	100

Table 3. Percentage composition of various food species consumed by *Pomadasys jubelini*

Food items	NO	%NO	FO	%FO	G	%G	IRI	%IRI
Ethmalosa fimbriata	5	3.81	5	4.50	9	5.41	41.60	0.56
Sardinella maderensis	7	5.34	7	6.30	4.7	2.82	51.50	0.69
Scomberomosus tritor	8	6.10	8	7.20	15.6	9.39	111.7	1.51
M. macrobrachion	36	27.48	34	30.63	51	30.70	1782.1	24.08
Callinectes amnicola	74	56.48	56	50.45	84.32	50.75	5410.7	73.1
Littorina anguilifera	1	0.76	1	0.90	1.5	0.90	1.5	0.02
Total	131	100	111	100	16.12	100	7399.1	100

Key: NO = Numerical method FO = Frequency of occurrence method
PT = Points method G = Gravimetric method IRI = Index of relative importance

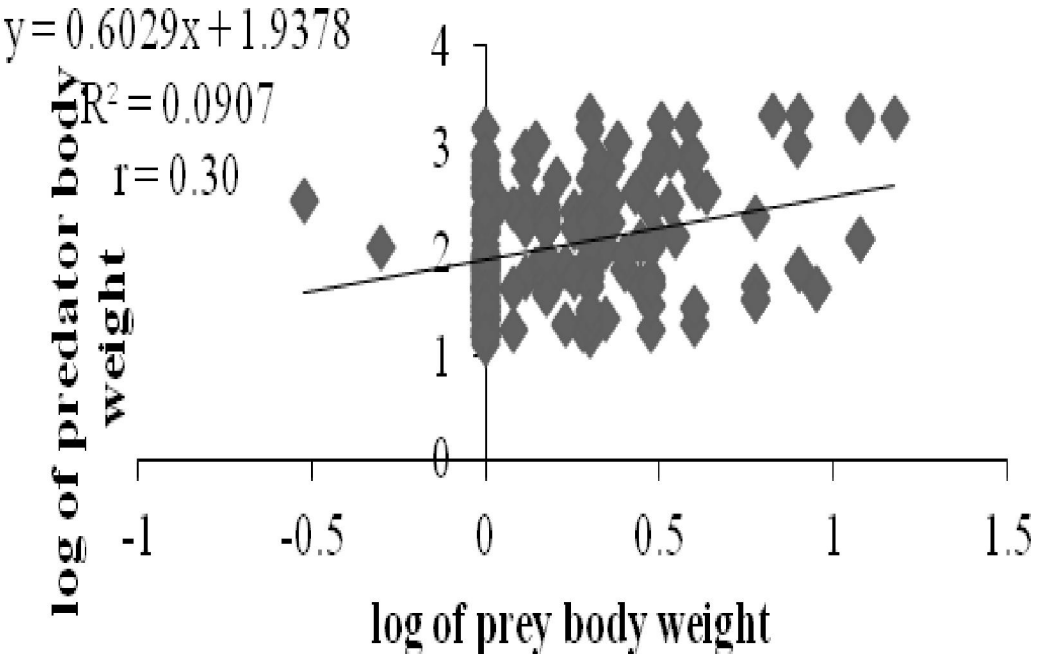

Figure 1: Relationship between prey body weight and *P. jubelini* body weight

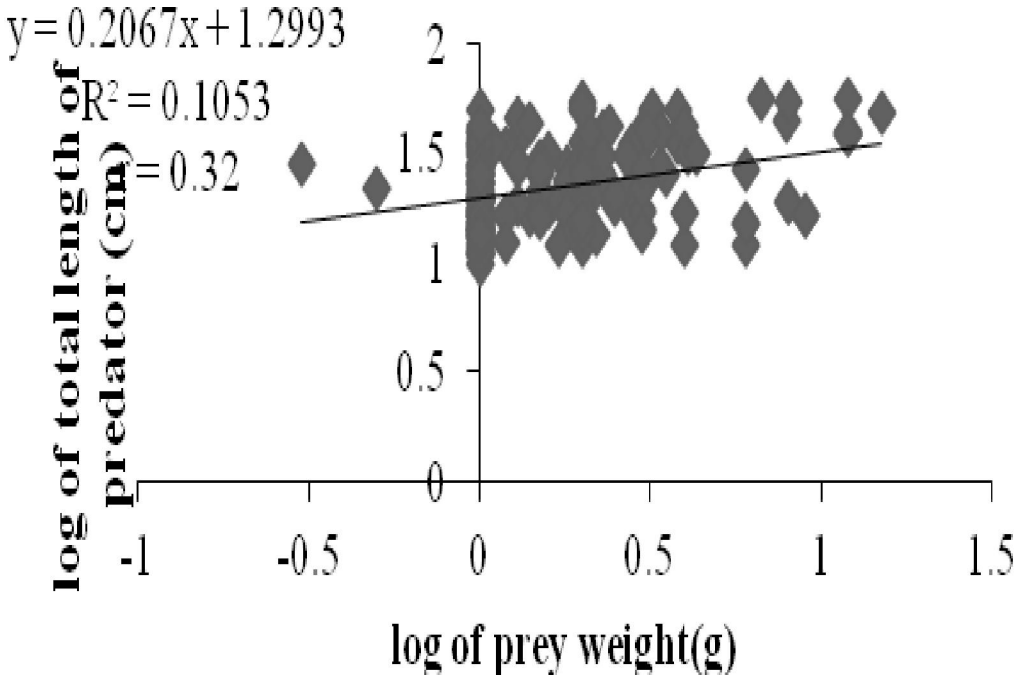

Figure 2: Relationship between prey body weight and *P. jubelini* body length

4.0. Discussion:

High proportions of empty stomachs (56%) of *P. jubelini* were observed in this study. This trend in predatory species has also been reported by Balogun (2000), Bachok *et al*. (2004) and Chukwu *et al*. (2009) and it appears to be a common phenomenon. This may reflect short periods of feeding followed by rapid periods of digestion. This is contrary to the finding of Adebiyi (2011) were only 45 (8.9%) out of 450 specimens examined had empty stomachs. This high percentage of empty stomachs found in predatory species may also be due to the well developed stomach activities due to rapid digestive rates. The dominant prey species; *Macrobrachium macrobrachion, Sardinella maderensis*, *Scomberomosis tritor* and *Ethmalosa fimbriata* were found in larger size classes (adults) of the fish while *Macrobrachium macrobrachion* (shrimps), *Littorina anguilifera* (clam) and *Callinectes amnicola* (freshwater crabs) were mainly found in smaller sizes (juveniles) of the fish caught. The result of this study is in agreement with the findings of Idodo-Umeh (2007) Adebiyi (2011) and Froese and Pauly (2013). The restriction of fish prey choice of *P. jubelini* to only the three species (*Sardinella maderensis*, *Scomberomosis tritor* and *Ethmalosa fimbriata*) observed could be a strong pointer toward specificity in their feeding habit (prey selection). *Callinectes amnicola* was the main prey by number (56.48%) and weight (50.75%) contributing mainly to the relative importance of food for *P. jubelini* in the New Calabar-Bonny River. Several carnivorous species have shown a shift from generalist to specialist in their feeding habits. Landry (1997) found recorded marked changes in the diets of codfish with progression from copepods and plank tonic crustaceans in the juveniles to herring in the adults. The transition in the feeding habits of *L. niloticus* was observed in Lake Kianji and a transition from invertebrates and small size prey fishes at the juvenile stage to piscivorous diets at the sub adult and adult stage (Balogun, 2000). Carnivorous fishes choose their food items and do not necessarily feed on the most abundant items even if it were suitable (Kulbicki *et al*., 2005). Beukers-Stewart and Jones (2004), also showed that many carnivorous species specialize in their feeding habits as they approach maximum size. These changes in diet go with changes in biotope as adult fish can cover wider areas to feed whereas small fishes are restricted for various reasons; predation, energy saving and swimming abilities. There also seems to a special liking for specific food items with age among most carnivores generally. Most of the prey observed in the stomachs were often intact, an indication that it swallows its prey whole thus imposing maximum limit on the size of its prey. In this study, the sex of the fish did not have any effect on the kind and quantity of food ingested. Furthermore, the season did not also have any positive or negative effect to the availability of food taken by the fish, this is however due to the fact that this river is a good breeding ground for these different prey species and can sustain and maintain their abundance all year round. This result is confirms earlier reports of Deekae and Henrion (1993) on the multivariate analysis of species distribution in the New Calabar River and Deekae (2009) on the abundance of *M. macrobrachion* in Luubara creek.

The relationship between predator body weight and prey body weight was linear and positive meaning an increase in the general size (body weight or length) of *P. jubelini* results to an increase if the weight of prey consumed. Olatunde (1978a), in the study of the food and feeding habits of *Eutropius niloticus* in Lake Kianji, Nigeria reported that various dietary item decrease or increase in importance with age. It was also stated that this change could was attributed to the size of the prey organism in relation to the size of the predator and to the ease of obtaining prey. Furthermore, the early stages of life, the food items selected were small but as the predator increased in size a similar increase was also noted in the size of prey. The findings made by Balogun (2000) on the study of *L. niloticus* also showed an increase in the size of fish resulting to an increase in the prey size, the prey were often found intact in the stomachs of the fish, indicating that it also swallows its prey whole.

REFERENCES:

1. Adebiyi, A. M. (2011). Dietary items and feeding habits of Sompat grunt *Pomadasys jubelini* (Cuvier, 1830). *Nature and Science*, 9 (12) 69 – 75.
2. Allison, M. E. (2006). The Ecology and Fishery Of *Parailia pellucida* (Boulenger 1901) (Shilbeidae) in Lower Nun River of the Niger Delta. Unpublished PhD Dissertation, Uniport. 267 pp.
3. Amakiri, N. E. (2009). Aspects of ecology and population dynamics of *Chrysichthys furcatus* (Gunther, 1964) from Upper Sombreiro River, Nigeria. Unpublished M. Sc Thesis, Rivers State University of Science and Technology. 269pp.
4. Bachok, Z., Mansor, M. I. and Noodin, R. M. (2004). Diet Composition and food habits of demersal and pelagic marine fishes from Ternggganu waters east coast of Peninsular Molayia NAGA. *World fish center quarterly vol.* 27(3&4): 41-47.
5. Bagenal, T. B. (1978). *Methods of the assessment of fish production in fresh waters.* Oxford. Pp 165- 201.

6. Balogun, J. K. (2000). Food and Feeding Habits of Nile perch (*Lates niloticus* LINNE) in Lake Kianji, Nigeria. J*ournal of Agriculture and Environment.* 1 (2); 131-140.
7. Beukers-Stewart, B. D. and Jones, G.P. (2004). The influence of prey abundance on the feeding ecology of two piscivorous species of coral reef. *J. Exp. Mar. Biol. Ecol*. 299; 155-184.
8. Chukwu, K. O. Deekae, S. N. and Tawari, C. C. (2009). Comparative study on the food and feeding habits of *Sphyraena afra* Peters (1844) in Elechi and Amadi creeks Porthacourt Nigeria. African Journal of Bioscience, 2 (2): 81-86
9. Chukwu, K. O. Deekae, S. N. and Tawari, C. C. (2009). Comparative study on the food and feeding habits of *Sphyraena afra* Peters (1844) in Elechi and Amadi creeks Porthacourt Nigeria. African Journal of Bioscience, 2 (2): 81-86.
10. Deekae, S.N. (2009). Population biology of *Machrobrachium machrobrachium* in Luubara creek. Unpublished Ph.D Thesis. Rivers state University of Science and Technology. Porthacourt. 257pp.
11. Deekae, S.N. and Henrion, R. (1993). Multivariate analysis of species distribution: A survey on occurrence of Mangrove mollusc in the Bonny and New Caliber River of the Niger Delta. *Acta hydrochim: hydrobiol*, 21 (5): 273-279.
12. Deekae, S.N. and Henrion, R. (1993). Multivariate analysis of species distribution: A survey on occurrence of Mangrove mollusc in the Bonny and New Caliber River of the Niger Delta. *Acta hydrochim: hydrobiol*, 21 (5): 273-279
13. F.A.0. (1981a). *Species identification sheets for fishery purposes.* Fischer, W., Bianchi, G. and Scott, W.B. (*ed*). Easter Central Atlantic; fishing areas 34, 47.
14. F.A.O. (1981b).*World fishes and the law of the sea*, FAO, Rome 30pp
15. Froese, R. and Pauly, (2013). www.fishbase.com. Food and Feeding Habits *Pomadasys jubelini* retrieved 4/2/2013
16. Idodo-Umeh, G. (1987). Studies on the fish community of River Ase, Bendel State with special emphasis on the food and feeding habits of Citharinidae, Bagridae, Schilbidae, and Mokochidae, PhD Thesis, University of Benin, Benin City. 412pp.
17. Idodo-Umeh, G. (2003). *Fresh water fishes in Nigeria*, (Taxonomy, Ecological notes, Diets and Utilization). Idodo-Umeh Publishers, Benin City. Nigeria. Pp 123-124.
18. Ikomi, R.B. and Odum, O. (1998). Studies on aspects of the ecology of the catfish *Chrysichthys auratus* Geoffrey St. Hilare (Osteichthyes; Bagridae) in the River Benin (Niger Delta, Nigeria). *Fisheries Research*, 26: 187-198.
19. Kulbicki, M., Bozec, M. Y., Labross., Letourneur, Y., Mou-Tham, G. and Wantiez, L. (2005). Diet composition of carnivorous fishes from coral reef lagoons of New Caledonia. *Aquat. Living Resource*. M18, 231 - 250
20. Lagler, K.F., Bardarch, J.E., Miller, R.K. and May Passino, D. R. (1978). *Ichthyiology*. 2nd edition. John Wiley and sins Inc. Florida, USA. Pp129 -163.
21. NEDECO. (1961). *The waters of the Niger Delta*: Reports of an investigation by (Netherlands engineering consultants) NEDECO. The Hague. 98pp.
22. Olatunde, A.A. (1978a). The food and feeding habits of *Eutropius niloticus* (Ruppell), Family Schilbeidae (Osteichthyes: Siluriformes) in Lake Kianji, Nigeria. *Hydrobiologia* 57(3): 197-207.
23. Sikoki, F.D. and Francis, A. (2007). *An Atlas of Fin Fishes of the Andoni River in Niger Delta, Nigeria.* Molysfem Unites Services, Porthacourt. 64pp.
24. Ugwumba, A.A. and Ugwumba, O.A. (2007). *Food and feeding Ecology of Fishes in Nigeria*. JodetanVentures. Ibadan. (70pp).
25. Viveen, W.J.A.R., Richter, C.J.J., Van Jassen, J.A.L. and Huisman, E.A. (1977). *Practical Manual for the culture of the African catfish. (Clarias gariepinus).* Joint publication of the Directorate General International Cooperation of the ministry of foreign affairs. The Hague, The Netherlands, Department of Fish Culture and Fisheries of the Agricultural University of Wageningan, the Netherlands and Research Group for comparative Endocrinology, Department of Zoology of the University of Utrecht, Netherlands, 94pp.
26. Welcomme, R.L. (2001). *Inland Fisheries*: Ecology and Management. 353pp.

12/24/2013