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THE FOOD AND FEEDING HABITS OF AFRICAN PIKE, *HESPSETUS ODOE* (BLOCH, 1974) (OSTEICHTHYES: HEPSETIDAE) IN ADO-EKITI RESERVOIR, NIGERIA.

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Abstract
Investigations were carried out on the food and feeding habits of *Hepsetus odoe* in Ado-Ekiti Reservoir, Nigeria, between May 2002 and July 2004. The dietary composition showed the species to be a piscivore, feeding mainly on tilapias. Other fish food were *Barbus* sp., *H. odoe* and *Clarias* sp. Fish constituted a total of about 72%, 40% and 88% of the food by number, occurrence and volume respectively. Insects such as the water beetle *Acilius* sp., dragon fly, *Aeschna* sp. nymph and higher plant materials including leaves, stems and roots were supplementary food items. Insects constitute about 26% of the food by number and less than 10% by occurrence or volume; while higher plant materials made up less than 10%. Minor food items were the river prawn, *Macrobrachium* sp. and gastropod mollusc, *Bulinus globosus* which made up less than 1% of the food. *H. odoe* exhibited diurnal and seasonal variations in feeding intensities. Feeding was higher in the rainy season (mean index of fullness = 0.80 ± 0.66%) than dry season (mean index of fullness = 0.50 ± 0.53%) in females while the reverse was the case for the males (mean indices of fullness = 0.50 ± 0.34% and 0.97 ± 0.98 in rainy and dry seasons respectively). Feeding commenced shortly before 06.00hrs in the dry season but long before this time in the rainy season. Size of fish did not significantly affect feeding intensity of *H. odoe* in the reservoir.

Keywords: *Food, feeding habits, diurnal and seasonal variations, Hepsetus odoe, Ado-Ekiti Reservoir.*

Introduction

The African pike, *Hepsetus* (*Sarcodaces*) *odoe* (Block, 1974) is the only species of the Family Hepsetidae. It is a freshwater fish, widely distributed in rivers and freshwater lagoon systems of Africa (Reed *et al.*, 1967; Petr, 1968; Lowe-Mc Connel, 1975; Merron *et al.*, 1990 and Kirk *et al.*, 1994; Idodo-Umeh, 2003).

The species is an economically important fish in Nigerian freshwaters. It constitutes part of the bulk of capture fisheries in many areas, yet it has not been adequately studied in Ado-Ekiti Reservoir.

Food and feeding habits of *H. odoe* had been previously reported in River Sokoto (Reed *et al.*, 1967); Upper Volta (Adiase, 1969); Kainji Lake (Imevbore and Bakare, 1970); Upper Ogun River (Adebisi, 1978); Epe Lagoon (Balogun, 1980); International Institute of Tropical Agriculture (IITA) Reservoir, Ibadan (Moriarty, 1983); Lekki Lagoon (Ugwumba and Kusemiju, 1994) and Zambezi River flood plain (Winemiller *et al.*, 1994). These reports were mostly on the dietary spectrum.

The results presented here are on the spatial and temporal variations in food and feeding habits of *H. odoe* in Ado-Ekiti Reservoir. Size and sex dependent variations are also highlighted.

Materials and Method

The study Area

Ado–Ekiti Reservoir was constructed by damming River Ireje in Ado-Ekiti, Ekiti State, Nigeria in 1958. It is a major source of water supply for domestic uses and also supports artisanal fisheries (Agbeyo, 1976). Topography is undulating , at an altitude of about 440m and surrounded by highlands. The reservoir lies between latitude 7°37' North and longitude 5° 13' East of the Equator (Figure1). Ado –

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Ekiti lies within the tropical rainforest zone of south – western Nigeria and experiences a tropical climate with distinct dry season (from November to March) and rainy season (from April to October). Adebayo (1993) reported that the mean air temperature and annual rainfall of Ado-Ekiti were 27°C and 1,367mm

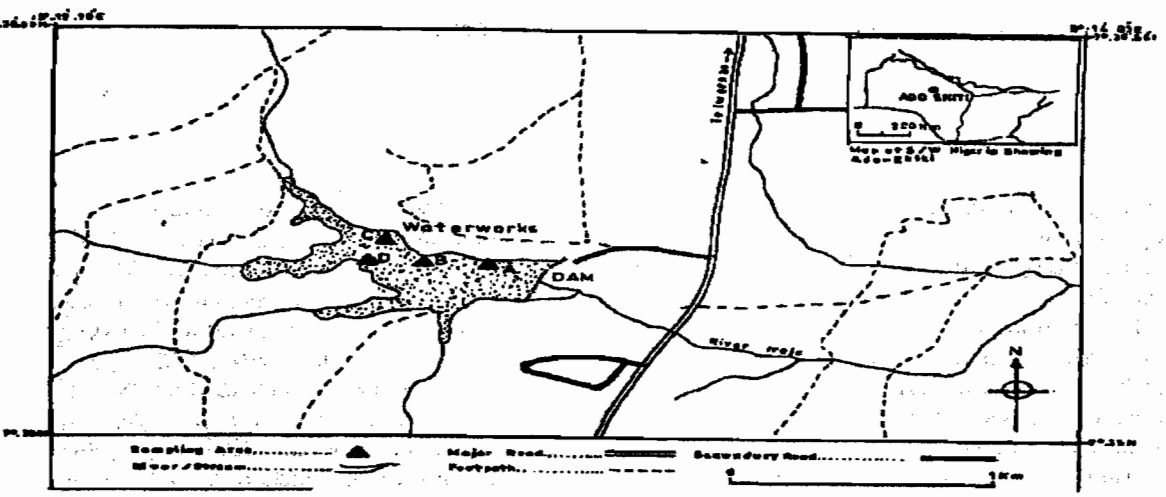

Fig. 1. Map of Ado-Ekiti Reservoir (shaded area) showing sampling stations (A,B,C&D)

respectively. Relative humidity of the reservoir was 60 - 80% while alkalinity and pH were 48mg$CaCo_3$/l and 7 respectively (Agbeyo, 1976).

The adjourning vegetation was dominated by: Elephant grass (*Pennisetum purpureum*), Giant star grass (*Cynodon plectostachyum*), Rhodes grass (*Chloris guyanana*) and Siam weed (*Eupatorium odorantum*). The ichthyofauna consists of the tilapias, *Tilapia zillii, Sarotherodon galilaeus, Sarotherodon melanotheron* and *Oreochromis niloticus*; catfishes, *Chrysichthys nigrodigitatus, Clarias gariepinus,* and *Heterobranchus bidorsalis* as well as *Hepsetus odoe* and the barb, *Barbus* sp.

Collection of samples and analysis of ingested food

Weekly samples of *H. odoe* were collected from fisher-folks at reservoir jetty between May 2002 and July 2004 and were immediately preserved in 10% formalin prior to laboratory analysis. Data on the diurnal feeding intensity were obtained from fish caught between 06.00 – 09.00hours, 09.00 – 12.00hours, 12.00 – 15.00hours and 15.00 – 18.00hours on two occasions (March and September 2003) for 4 days each. The weekly specimens collected for 12months between May 2003 and July 2004, were used for the determination of seasonal changes in feeding intensity.

Total length and weight were measured for each fish. Stomach content analyses were done using the numerical, frequency of occurrence and volumetric methods as in Hyslop (1980) and Getachew and Fernando (1989). Since each of these methods of stomach content analysis employed tend to emphasize the importance of different food items (Fagade,1971; Costa and Abeysiri, 1978 and Hyslop, 1980), relative importance index (RI) of each group of food organisms was also computed following Hyslop (1980) using the expression:

$$RI = 100\,AI / \sum_{i}^{n} AI$$

AI = % 0 + % N + % V
where
RI = Relative importance index
AI = absolute importance index
n = number of the different food items

Diurnal feeding intensities were determined by emptying the contents of the stomachs of individual specimens caught at different times of the day into previously weighed dishes. The samples were then dried at 70°C in an electric oven, Model OV-160 for 24hours, cooled in a desiccator for 20 minutes before taking the dry weights. The dry weights of the stomach contents were averaged for each three – hour sampling period. The same procedure was followed for the monthly samples (Moriarty and Moriarty, 1973; Ugwumba and Adebisi, 1992).

The index of fullness (IF) (Tudorancea *et al.*, 1988) was calculated using the formula:

$$IF = 100\ \frac{w}{W}$$

where w = dry weight of stomach content (g); W = fresh weight of fish (g).

Results

Food organisms

578 specimens of adult *H. odoe* measuring 13.50 – 33.40 in total length and 15.94 - 308g body weight were examined for food in their stomachs. Of these, 9 (1.23%) had empty stomachs. Items encountered in their stomachs are summarized in Table 1. Fish was the major food item, constituting 72% of the total number, 88% of the bulk of food by volume and occurred in about 40% of the stomachs with food. Tilapias were the major fish food accounting for 56% and 66% by number and volume respectively. Species of tilapias identified were *T. zillii*, *S. galilaeus* and *O. niloticus*. Other fishes identified included *Barbus* sp., *H. odoe*, and *Clarias* sp., and these accounted for about 5% or less of the food ingested.

Insects namely dragon fly (*Aeschna* sp.) nymph and water beetle (*Acilius* sp.) which were also part of the stomach contents constituted 27% by number and 6% or less by occurrence and volume. Higher plant materials including leaves, stems and roots accounted for 7% or less of the food. Other food items were the prawn, *Macrobrachium* sp. and gastropod, *Bulinus globosus* which contributed less than 1% to the food.

Seasonal variation in composition of diet

Seasonal variations in composition of the diet of *H odoe* are illustrated in Figures 2, 3 and 4. Fish dominated the food both in dry (November – April) and rainy (May – October) seasons, but higher values were recorded in the rainy (91 - 100% by number) than dry (36% - 81% by number) seasons. The highest consumption of fish was in September, June and July when the percentage number was 100% each. Fish was least consumed in March and April, 36% and 44% by number respectively. Insects were consumed more in dry than rainy seasons. Consumption of insects was highest during periods of least fish consumption. Highest consumption was in March and April when they made up 56% and 64% by number, than at other times of the year when the number was seasons. Consumption of insects was highest during periods of least fish consumption. Highest consumption was in March and April when they made up 56% and 64% by number, than at other times of the year when the number was less than 20% of the food. Prawn and gastropod were consumed only between October and December and constituted less than 20% of the number of food.

A similar pattern of seasonal dietary composition as numerical percentage composition was obtained when the frequency of occurrence and bulk of food items (using percentage volume) were considered. Fish also dominated the bulk of food (>80%) throughout the year.

Table 1: Summary of the stomach contents of *Hepsetus odoe* from Ado-Ekiti Reservoir

Food Items	Numerical No	Method %	Occurrence No	Method %	Volumetric Vol. (ml)	Method %
h						
apias						
apia zilli	9	1.33	9	1.10	18.24	0.79
otherodon galileaus	6	0.89	6	0.73	45.12	1.95
eochronis niloticus	3	0.44	3	0.37	75	3.26
identified tilapia	360	53.33	327	39.93	1,374	59.83
oth carp						
rbus sp.	6	0.89	6	0.73	1.44	0.06
ican pike						
osetus odoe	6	0.89	6	0.73	81	3.53
d cat fish						
rias sp.	6	0.89	6	0.73	34.62	1.51
dentified fish	87	12.89	87	10.62	300	13.06
h parts	-	-	222	27.12	92.46	4.02
ects						
ter beetle (*Acilius* sp.)	160	23.71	47	5.71	31.57	1.37
agon fly nymph (*Aeschna* sp.)	20	2.96	4	0.52	2.87	0.13
ect parts	-	-	6	0.73	0.60	0.03
wn						
crobrachium sp	6	0.89	6	0.73	0.90	<0.01
stropod						
linus globosus	6	0.89	6	0.73	0.02	<0.01
gher plant materials	-	-	57	6.96	93.30	4.06
dentified mass	-	-	474	57.86	145.35	6.33

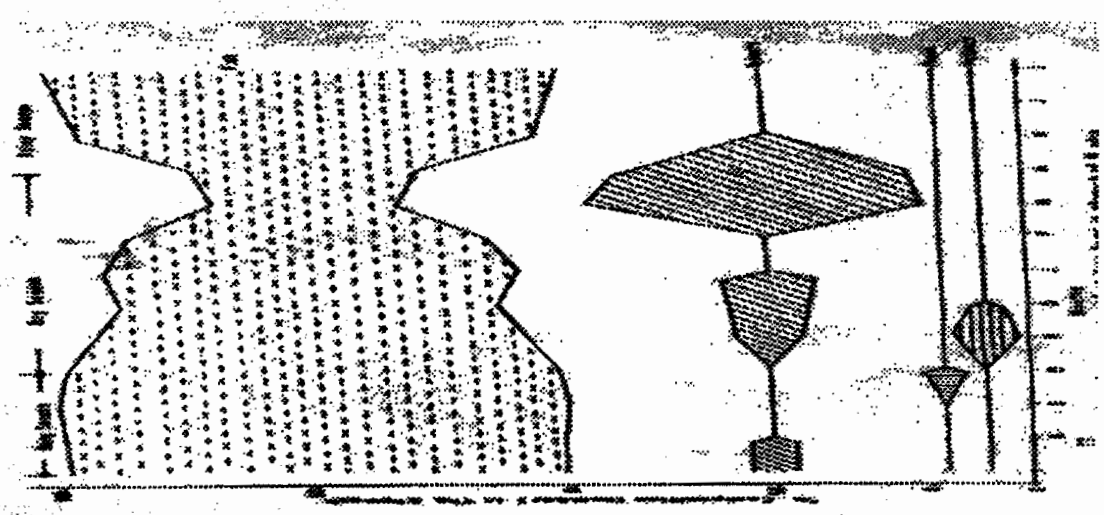

Fig. 2: Monthly variation in groups of food items found in the stomachs of *H. odoe* by number.

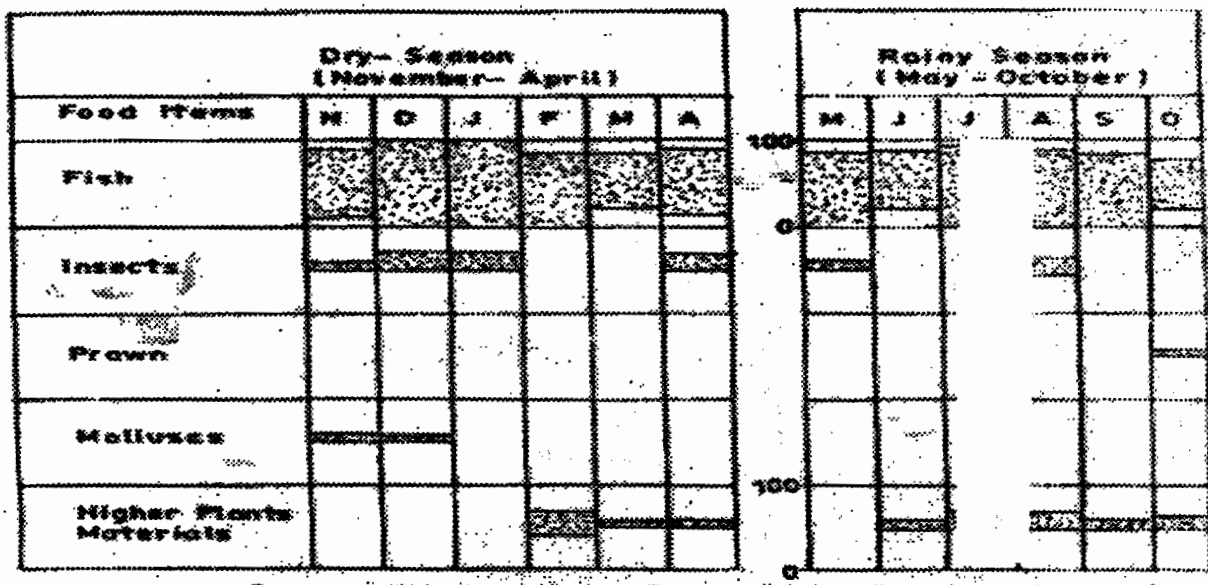

Fig. 3: Seasonal percentage frequency of occurrence of various groups of food items in the stomach of *H. odoe*

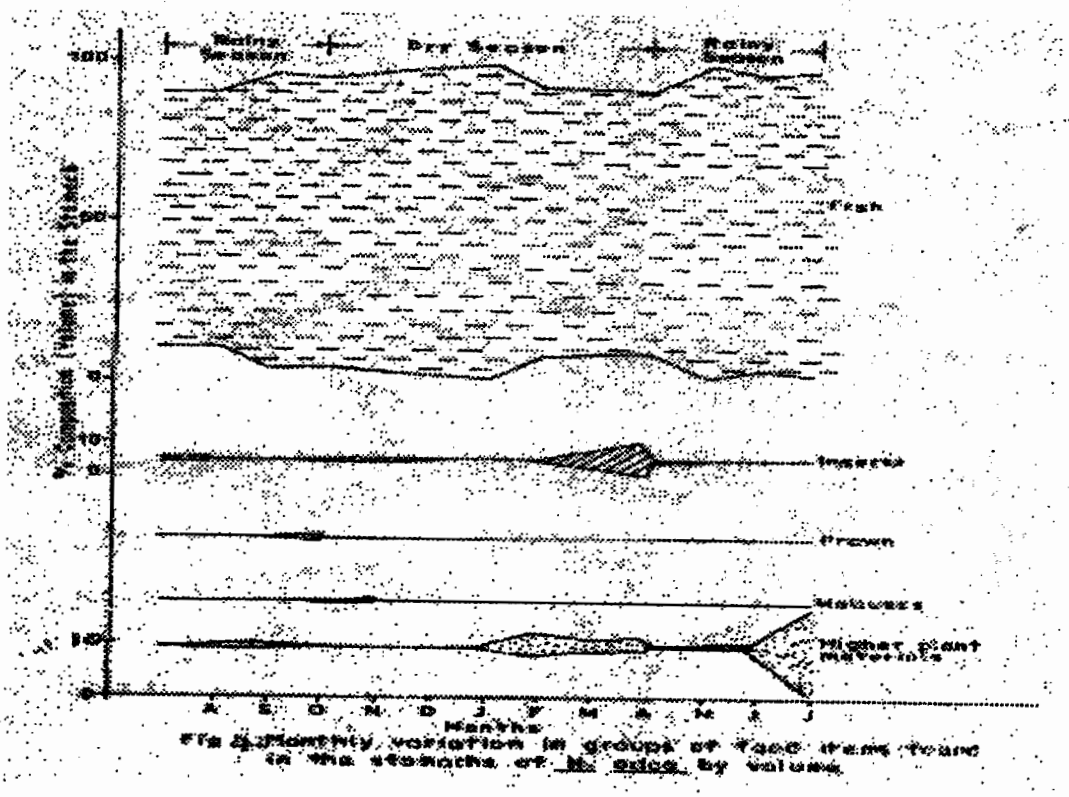

Fig. 4: Monthly variation in groups of food items found in the stomachs of *H. odoe* by volume

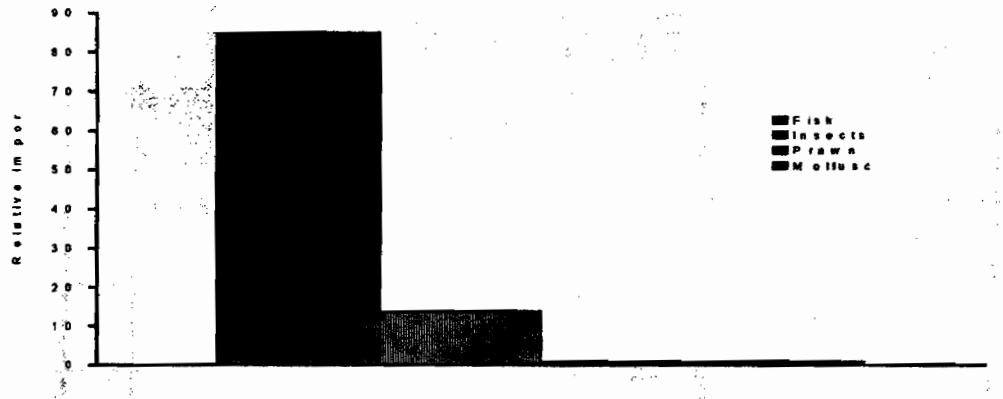

Fig. 5: Relative importance index (RI) of the various groups of items in the diet of *H. odoe*

Relative importance index (RI) of food items

The relative importance indices of the different groups of food items are illustrated in Figure 5. RI values also showed that fish was the most important food of *H. odoe* in the reservoir constituting about 85% while insects ranked next with 15%. Other food items such as prawn and gastropods had less than 1% RI value each.

Feeding habits

Diurnal feeding intensity

The diurnal feeding intensity of *H.* odoe based on relative importance index using stomach contents is illustrated in Figure 6. In March, feeding intensity was lowest in the morning 06.00-09.00hrs when the mean dry weight of stomach content was 0.1% of the fresh body weight of fish. Highest feeding (0.5%) was in the evening, 15.00-18.00hrs. In September, feeding intensity was lowest in the evening, the mean dry weight of food was 0.4% of the fresh body weight; highest feeding intensity (0.7%) was in the morning.

Monthly variation in feeding intensities

The monthly variations in feeding intensity of female and male *H.* odoe based on index of fullness (IF) from dry stomach contents are illustrated in Figure 7. In females, feeding was highest in the rainy season (September) with IF value of 0.8% drye, 0.1% was in June.

Relationships between IF and size of male and female *H. odoe* are illustrated in Figures 8, 9, 10 and 11. The correlation coefficients of these relationships were positive in females (0.07 and 0.14), negative in males (-0.15 and -0.12) and were all insignificant ($P > 0.05$).

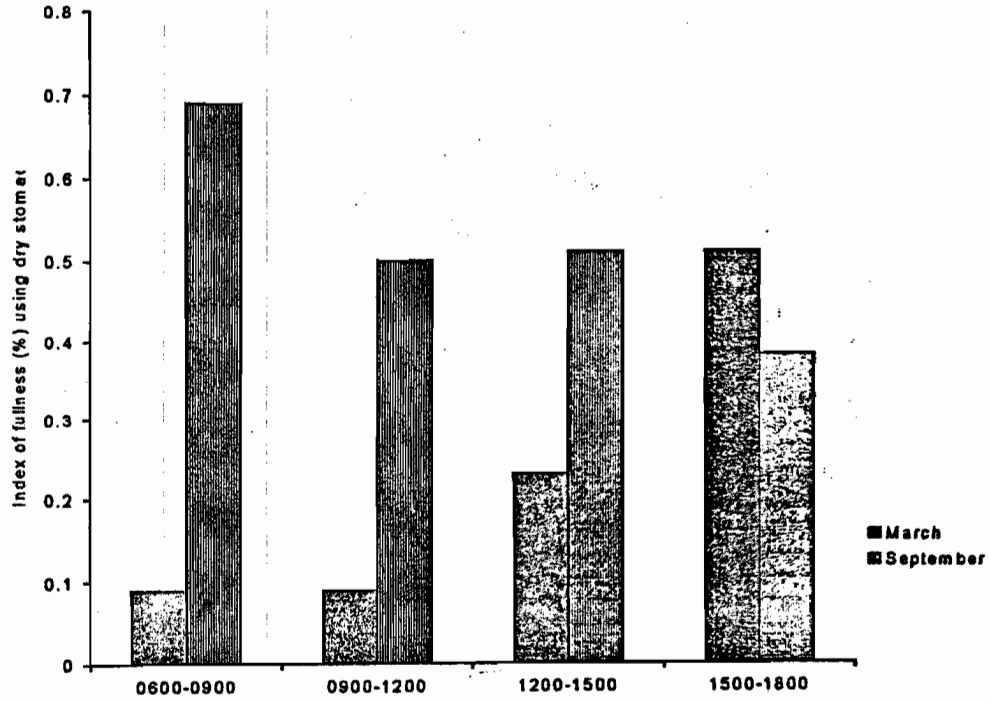

Fig. 6: Diurnal changes in the feeding intensity of *H. odoe* in March and September, based on index of fullness using dry stomach contents. The mean fresh weight of fish e at each period is indicated

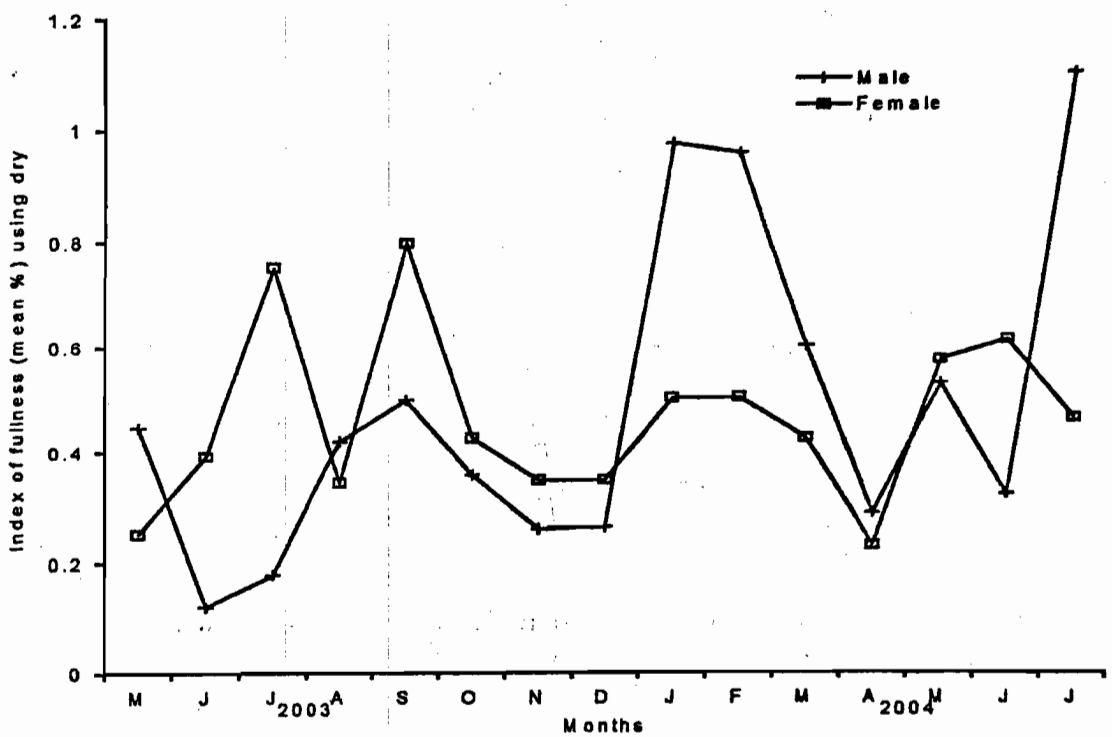

Fig. 7: Monthly changes in feeding intensity of Male and Female *H. odoe* based on index of fullness

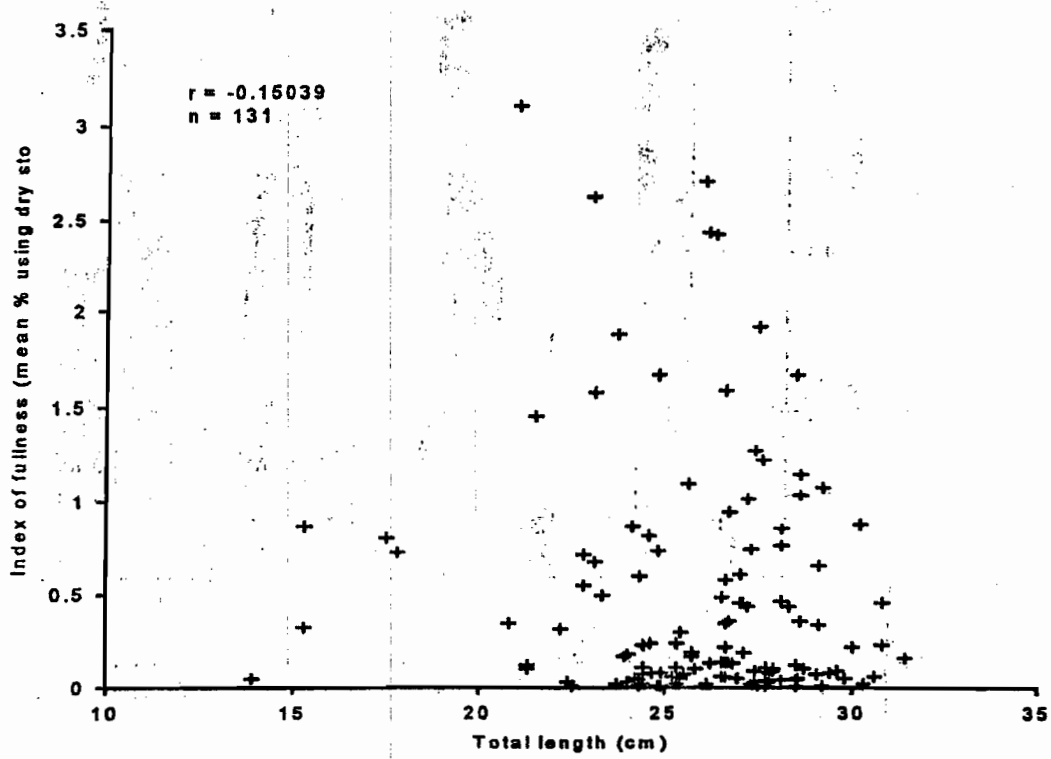

Fig 8: Relationship between feeding intensity based on index of fullness (IF) and total length of male *H. odoe*

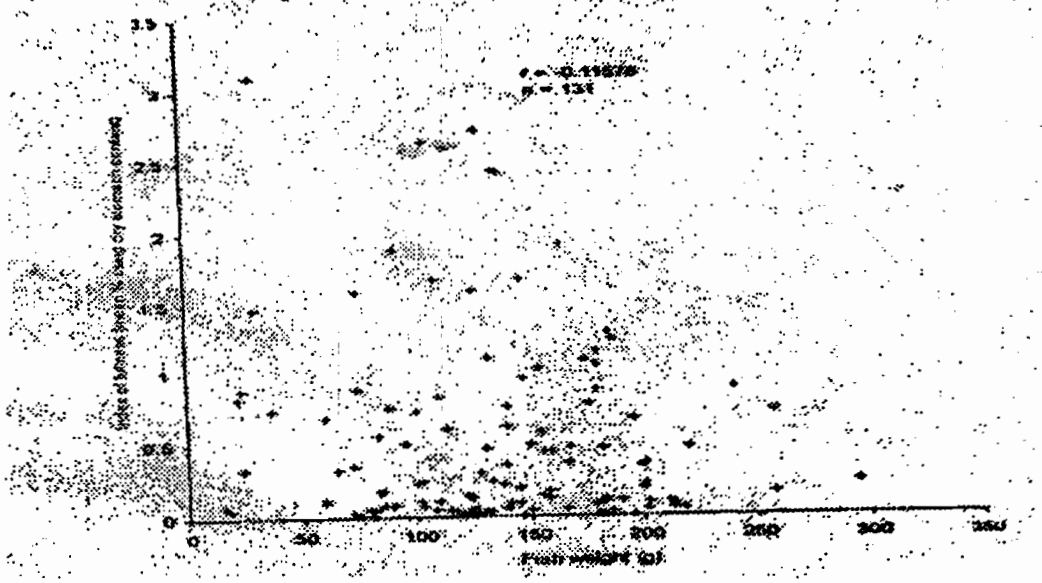

Fig. 9: Relationship between feeding intensity based on index of fullness (IF) and weight of male *H. odoe*

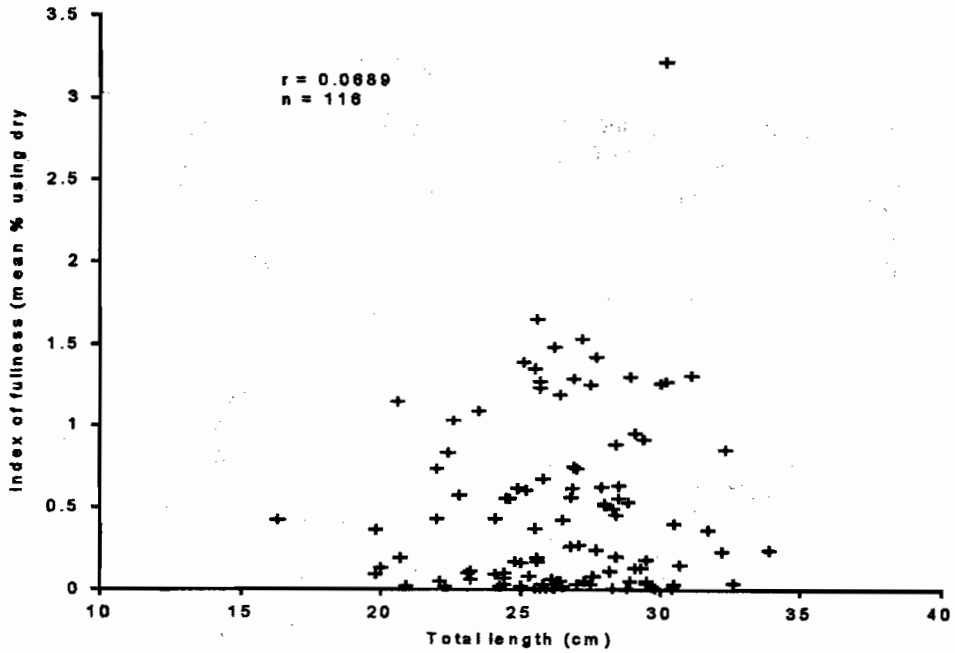

Fig. 10: Relationship between feeding intensity based on Index of fullness (IF) and total length of female *H. odoe*

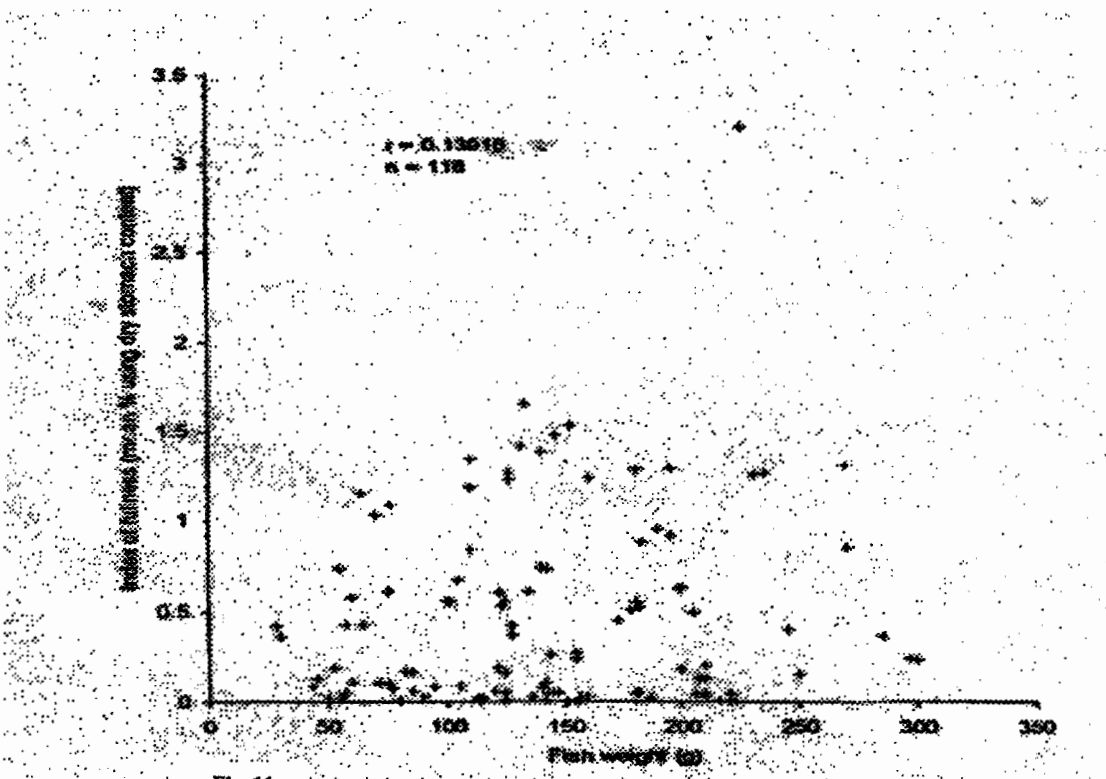

Fig. 11: Relationship between feeding intensity based on Index of fullness (IF) and weight of female *H. odoe*

Discussion

The dietary composition showed *H. odoe* to be a piscivore in Ado-Ekiti Reservoir. This classification agrees with that of Reed *et al.* (1967), Adiase (1969), Imevbore and Bakare (1970), Adebisi (1978), Balogun (1980), Moriarty (1983), Winemiller and Kelso-Winemiller (1994) and Ugwumba and Kusemiju (1994). Insects and higher plants can be regarded as supplementary food while prawns and gastropods are minor food items of the species in the reservoir.

Tilapias were the major food items throughout the year. This is not surprising since tilapias are the most abundant fish in Ado-Ekiti Reservoir which made them to be available for *H. odoe* to feed on. Over-exploitation of tilapias in the reservoir will likely adversely affect abundance of *H. odoe* in the reservoir. The major fish prey, tilapias, reported in the present study, agrees with Adiase (1969), Adebisi (1978), Winemiller and Kelso-Winemiller (1994) and Ugwumba and Kusemiju (1994) that cichlids and cyprinids (*Barbus* sp.) were the major fish prey of the species in Volta Lake, Upper Ogun River, Zambezi River flood plain and Lekki Lagoon respectively. However, in River Sokoto and Epe Lagoon, *Alestes*, *Elops lacerta* and *Pellonula afzeliusi* were the major fish preys (Reed *et al.*, 1967; Balogun, 1980).

There was seasonal variation in abundance of supplementary food items. The bulk of insects and higher plant materials were consumed when there was a drop in the bulk of tilapias consumed. This supports the assertion by Ikusemiju (1973) that most fish will supplement on any dietary item when the major food items are in short supply. The diurnal feeding cycle of *H. odoe* showed that feeding started in the morning in March probably shortly before 06.00 hours since feeding intensity was least at this time. However, in September, feeding must have started long before 06.00 hours since feeding intensity was highest at this time. This difference could probably be partly due to preference/availability of preys because August/September is a the peak period of abundance of its major prey (tilapias) in the reservoir and this may have enhanced their early feeding long before day light in the rainy season. In the dry season, prey abundance may not have been a determinant factor but probably prey visibility.

The fact that seasonal feeding intensity was higher in the rainy season than in the dry season in females while the reverse was the case for the males could be due to the fact that females require more food for their reproductive activities (yolk accumulation) which was observed to be at its peak during the rainy season in the reservoir. The insignificant correlation between feeding intensity and size of *H. odoe* indicates that size of fish did not play a significant role in feeding intensity.

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