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THE FOOD AND FEEDING HABITS OF FISHES OF THE JAMIESON RIVER, NIGERIA

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121 specimens of teleosts comprising of 23 species, 17 genera and 11 families were examined in the study of the ichthyofaunal food habits of the Jamieson River. Cichlidae (34.78%) was richest in species number, and a Bagridae, *Chrysichthys furcatus* (28.93%) was the most numerical species. Analysis of the stomach contents revealed algae, diatoms, macrophytes, zooplankton, shrimps, insects, fish, fish scales, detritus, sand and unidentified material as the main food categories selectively eaten by Jamieson River fishes. The fishes exhibited benthopelagic exploitation and grazing tendency.

Key words: Food and feeding habits, Fishes, Jamieson River.

Introduction

The diet of fishes is a subject of continuing research. Studies on the food and feeding habits of fish continue to attract considerable attention, being the basis for the development of successful capture and culture fisheries management (Lauzanne 1983). The feeding of freshwater fish has been extensively investigated in West Africa particularly in Ghana (Blay 1985) and Nigeria. In Nigeria studies have been performed in Lake Kainji (Imevbore and Bakare 1970; Arawomo 1976; Olatunde 1979); in upper Ogun River (Adebisi 1981); in Lagos and Lekki Lagoons (Fagade 1971; Fagade and Olaniyan 1973) and in a number of rivers in the Niger Delta area (Brown 1985; Umeh 1987; Tetsola 1988; Odum 1992). Information on the feeding habits of fish species will aid the study of trophic relationships (Baijot and Moreau 1997).

In Ethiope River, confluent with Jamieson River, Odum (1992) portrayed the fishes as feeding on a wide spectrum of food organisms from different niches.

Feeding habits of fish species in African flood plain rivers have been reviewed by Welcomme (1979). Lauzanne (1983) also presented a detailed account of the trophic relations of Lake Chad fishes.

Jamieson River is important for commercial fishing and timber raft transportation. The only elaborate fisheries investigations report in this river are on the fish communities entailing diversity, abundance and distribution, also dietary habits of *Brycinus nurse* Ruppel 1832 (Ikomi and Sikoki 1998, 2001). The main objectives of this study are to present species composition and the food and feeding habits of teleost fishes in Jamieson River.

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Materials and Methods

Study Area. River Jamieson is a tributary of Benin River. It is located between Lat 5°54' – 6°00'N and Long 5°41'-5°58'E. The source of the river is at Ugboko-Niro. The river flows southwards through Akuodo, Efurokpe and Oriaja to Sapele Township, where it empties into the Benin River (Fig 1). The entire length is approximately 70km.

The Jamieson River lies in the area with tropical rain forest climate. The rainy season is from March to October. The dry season is from November to February.

The sampling zone for this study is extended from Akuodo through J.A. Thomas Rubber Factory to the Ethiope - Jamieson confluence at Sapele.

It flows through a rain forest vegetation area with characteristic tall trees canopies, effectively shading light from the fringing forest floor. Aquatic floating plants are water lilly *Crinum jagas* and water hyacinth *Eichhornia crassipes*.

Most of the human communities along the bank of the Jamieson River are essentially rural and the freshwater river serves for bathing, washing, commercial fishing, and timber floating and occasional human transport.

The study was conducted from May to July 1995 to determine the species composition and food habits of teleosts. 121 fish specimens were collected with the help of hired fishermen from Akuodo, Efurokpe and Oriaja using cast nets, hook and line. They were put in a cooler containing ice blocks and transported to the laboratory in University of Benin, Nigeria and all of them were identified with guides (Daget and Iltis 1965; Reed *et al* 1967; Holden and Reed 1972). Measurements of each fish were taken of the total length, standard length and weight after mopping peripheral water with filter paper.

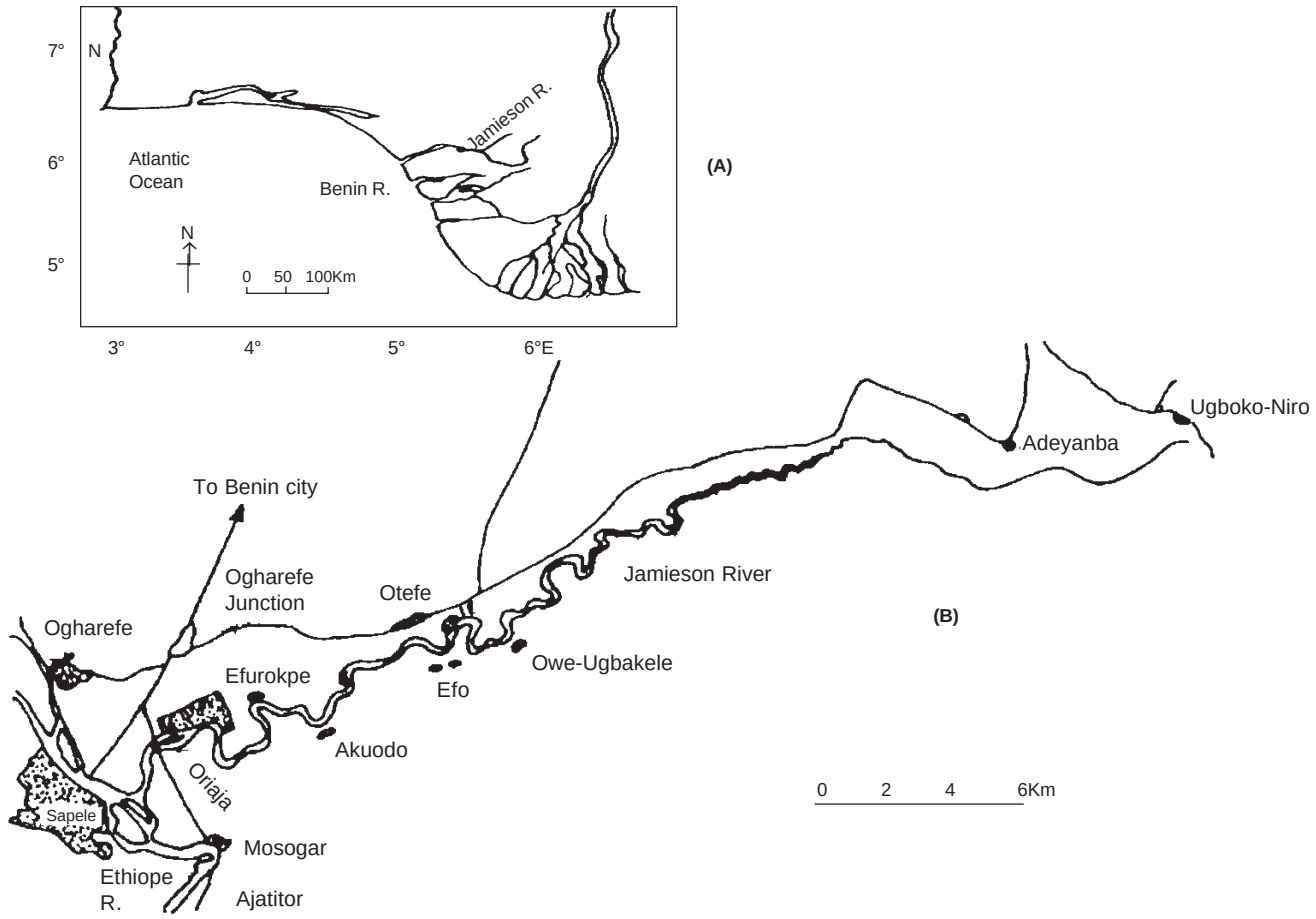


Fig 1. Map of study area showing location (A) and the course (B) of the River Jamieson.

The contents of the stomachs were analyzed to establish the diet of most fishes, but where no definite stomachs exist, the entire gut was inspected.

In the process, the abdomen of each fish was slit open to remove the stomach, further preserved in 4% formalin. Each stomach was in turn slit open, and its contents were emptied into a petri dish.

The macro-organisms were sorted out and the remaining microscopic organisms were examined under a dissecting microscope and a binocular NIKON Compound microscope (Magnification 40 - 100x).

Two methods employed in the analysis of the stomach contents were fullness method and frequency of occurrence.

Fullness method. The fullness of each stomach was assessed using a ranking procedure. The degree of fullness was scored as Empty (0/4), one-quarter (1/4), half (2/4), three-quarter (3/4), and full (4/4) stomachs (Ugwumba *et al* 1990).

Frequency of occurrence method. The number of stomachs of a species in which each type of food item occurred, was listed and expressed as a percentage of the total number of stomachs of that species examined, in order to determine the proportion of the fish population that fed on a particular food item (Hynes 1950). In addition, the relative frequency of occurrence newly used in this paper of each food item category in a fish species was obtained by further expressing the frequency of occurrence (%) as a percentage of the total frequency of occurrence (%) of all the food items categories in the same fish species, and the values were plotted as a bar graph. Also all stomachs in which each type of food item occurred in all fish species were summed up (summation frequency) and expressed as a percentage of the total number of stomachs examined.

Results and Discussion

Species composition. The community of teleost fishes in the Jamieson River is comprised of 23 species, 17 genera and 11 families. They are arranged alphabetically per family.

Bagridae (bagrid catfish) 13.04%; *Auchenoglanis biscutatus* (Geoffrey Saint Hilaire 1827) 2.48%; *Chrysichthys furcatus*

(Gunther 1864), 28.93%; *C. nigrodigitatus* (Lacepede 1803) 2.48%; Channidae (Snakeheads fish) 4.35%; *Channa obscura* (Gurther 1861), 4.13%; Characidae (Characin), 4.35%; *Brycinus longipinnis* (Gunther 1864), 4.13%; Cichlidae *(Cichlid perches)*, 34.78%; *Chromidotilapia guentheri* (Sauvage 1882), 0.83%; (Pelmatochromis) *Hemichromis bimaculatus* (Gill 1862), 4.13%; *H. fasciatus* (Peter 1857), 2.48%; *Pelvicachromis pulcher* (Boulenger 1902), 9.09%; (*Pelmatochromis*); *Tilapia heudelotii macrocephala* (Bleeker 1862), 2.48%; *T. mariae* (Boulenger 1899), 0.83%; *T. melanopleura* (Dumeril 1889), 8.26%; *T. zillii* (Gervais 1849), 8.26%; Clariidae (African mud catfish), 4.35%; *Clarias gariepinus* (Valenciennes 1840). 2.48%; Mochokidae (Mochokid catfish), 8.70%; *Synodontis eupterus* (Boulenger 1901), 4.96%; *S. omias* (Gunther 1864), 0.83%; Mormyridae (Elephant Snout fish), 8.70%; *Hyperopisus bebe occidentalis* (Lacepede 1803), 0.83%; *Petrocephalus bane ansorgii* (Lacepede 1803), 0.83%; Notopteridae (Featherbacks fish), 8.70%; *Papyrocranus afer* (Gunther 1868), 5.79%; *Xenomystus nigri* (Gunther 1868), 2.48%; Phractolaemidae (Blood fish), 4.35%; *Phractolaemus ansorgii* (Boulenger 1901), 1.65%; Polypteridae (Reedfish), 4.35%, *Erpetoichthys calabaricus* (Smith 1865), 4.13%; (*Calamoichthys*) Schilbeidae (schilbeid catfish), 4.35%; *Schilbe mystus* (Linne 1762), 0.83%.

Gut fullness. The results of analysis of stomach contents using the fullness method are shown in Table 1. Of the 121 specimens examined, only 18.18% were empty stomachs, 10.74% were fully loaded stomachs while 23.14%, 16.53% and 31.40% were partly full, 3/4, 1/2 and 1/4, respectively. It is noticeable that among the fish species represented by a single specimen, only a mochokid *Synodontis omias's* stomach alone was empty. The remaining five species characid *Brycinus longipinnis*; cichlids *Chromidotilapia guentheri* and *Tilapia mariae*; mormyrids *Hyperopisus bebe occidentalis* and *Petrocephalus bane ansorgii*, and schilbeid *Schilbe mystus* manifested different degrees of distended stomachs (Table 1).

Table 1
Filled portion of stomachs in Jamieson River fishes

Fish species	Number of specimens	4/4	3/4	1/2	1/4	0
Auchenoglanis biscutatus	3	1	1	1	–	–
Chrysichthys furcatus	35	5	4	5	14	7
C. nigrodigitatus	3	–	1	1	1	–
Channa obscura	5	1	2	–	–	2
Brycinus longipinnis	1	–	1	–	–	–
Chromidotilapia guentheri	1	–	1	–	–	–
Hemichromis bimaculatus	5	1	–	1	3	–
H. fasciatus	3	–	1	1	1	–
Pelvicachromis pulcher	11	1	3	2	3	2
Tilapia macrocephala	3	–	1	1	–	1
T. mariae	1	–	1	–	–	–
T. melanopleura	10	1	4	1	3	1
T. zillii	10	2	1	2	4	1
Clarias gariepinus	3	–	1	1	–	1
Synodontis eupterus	6	–	1	–	3	2
S. omias	1	–	–	–	–	1
Hyperopisus bebe occidentalis	1	–	–	–	1	–
Petrocephalus bane ansorgii	1	–	–	1	–	–
Papyrocranus afer	7	–	3	–	3	1
Xenomystus nigri	3	1	1	–	1	–
Phractolaemus ansorgii	2	–	–	1	–	1
Erpetoichthys calabaricus	5	–	1	1	1	2
Schilbe mystus	1	–	–	1	–	–
Total	121	13	28	20	38	22
%		10.74	23.14	16.53	31.40	18.18

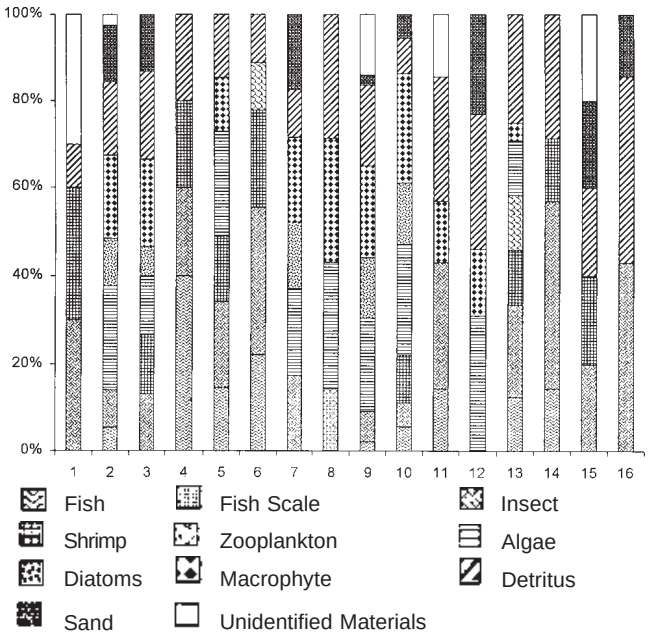
Table 2

The percentage of food items of fish species from Jamieson River

Food items	*A. biscutatus (3)*	*C. furcatus (35)*	*C. nigrodigitatus (3)*	*C. obscura (5)*	*H. bimaculatus (5)*	*H. fasciatus (3)*	*P. pulcher (11)*	*T. macrocephala (3)*	*T. melanopleura (10)*	*T. zillii (10)*	*C. gariepinus (3)*	*S. eupterus (6)*	*P. afer (7)*	*X. nigri (3)*	*P. ansorgii (2)*	*E. calabaricus (5)*
Fish	–	5.31	–	40.00	14.63	22.22	–	–	2.33	5.56	14.28	–	12.50	14.28	–	–
Fish scale	–	–	–	–	–	–	–	14.28	–	–	–	–	–	–	–	–
Insect	30.00	8.85	13.33	20.00	19.51	33.33	17.39		6.98	5.56	28.57		20.83	42.86	20.00	42.86
Shrimp	30.00	–	13.33	20.00	14.63	22.22	–	–	–	11.11	–	–	12.50	14.28	20.00	–
Zooplankton	–	–	–	–	–	11.11	–	–	–	–	–	–	12.50	–	–	–
Algae		23.81	13.33	–	24.39	–	19.57	28.57	20.93	25.00	–	30.77	12.50	–	–	–
Diatoms		10.62	6.67	–	–	–	15.22	–	13.95	13.89	–	–	–	–	–	–
Macrophyte		19.47	20.00	–	12.20	–	19.57	28.57	20.93	25.00	14.28	15.38	4.17	–	–	–
Detritus	10.00	16.81	20.00	20.00	14.63	11.11	10.87	28.57	18.60	8.33	28.57	30.77	25.00	28.57	20.00	42.86
Sand		13.27	13.33	–	–	–	17.39	–	2.33	5.56	–	23.08	–	–	20.00	14.29
Unidentified material	30.00	2.65	–	–	–	–	–	–	13.95	–	14.28	–	–	–	20.00	–

Number in brackets represent species quantity.

The results of stomach content analysis using the frequency of occurrence method were based on 16 fish species, which had two and more specimens. (Fig 2, Table 2). Algae, particularly diatoms, macrophytes, zooplankton, shrimps, insects, fish, fish scales, detritus, sand and unidentified material were the discerned stomach contents categories presumably taken in as food by the fish of Jamieson River. Insects (at larval, nymph and adult stages), shrimps and fish were seen in the guts as entire specimens either at early or advanced stage of digestion. Sometimes disarticulated parts, frequently appendages (antennae, legs, wings), and heads were noticed. The summation frequency of occurrence (%) of the food categories present interesting findings. Employing the summation frequency data, rather than individual species frequency of occurrence only, algae occurred in 60.53% stomachs and macrophytes in 52.63% of the specimens clearly showing that such proportions of the fish examined were herbivores and also able to capture insects (43.86% occurrence) associated with littoral aquatic vegetation and river bottom. The occurrence of diatoms in 27.19% of the stomachs was much higher than zooplankton (3.51%) further pointing to the grazing tendency that detritus and sand occurred in 60.53% and 28.95% of the stomachs respectively, indicatively connotes



1= *Auchenoglanis biscutatus, 2=Chrysichthys furcatus, 3=C. nigrodigitatus, 4=Channa obscura, 5=Hemichromis bimaculatus, 6=H. fasciatus, 7=Pelvicachromis pulcher, 8=Tilapia macrocephala, 9=T. melanopleura, 10=T. zillii, 11=Clarias gariepinus, 12=Synodontis eupterus, 13=Papyrocranus afer, 14=Xenomystus nigri, 15=Phractolaemus ansorgii, 16=Erpetoichthys calabaricus.*

Fig 2. Bar graph showing relative frequency of food items in the stomachs of the River Jamieson teleosts.

bottom feeding habit, such that 16 species obtained some food from the bottom (Fig 2, Table 2). Furthermore, the occurrence of shrimps in 17.54% and fish in 18.42% of the stomachs also indicates benthopelagic exploitation by some fish species such as bagrids *Auchenoglanis biscutatus, Chrysichthys furcatus* and *C. nigrodigitatus,* cichlids *Hemichromis bimaculatus, H. fasciatus, Tilapia melanopleura* and *T. zillii*; channid *Channa obscura*; clariid *Clarias gariepinus,* notopterids *Papyrocranus afer* and *Xenomystus nigri*; and phractolaemid *Phractolaemus ansorgii*. Fish scale, showing minimal (0.88%) occurrence, should have been picked up by *T. macrocephala*.

The food and feeding reports here are in some cases consistent and comparable with results from other water systems. One of the specialized feeders encountered in this study, *Channa obscura*, consumed mostly fish (40%). The stomachs contained whole fry of *Hemichromis bimaculatus* and *Mormyrops* sp. of early stage of digestion. The young of this species also fed mainly on subdueable size of insects (20%), shrimps (20%) and little detritus (20%). These observations conform to studies elsewhere of Tetsola (1988) and Odum (1992) that adult *C.obscura* was a piscivorous predator. *A. biscutatus* contained much insects (100%) and shrimps (100%). Odum (1992) also classified it as a predator, but in Lake Kainji, Imevbore and Okpo (1975) categorized *C. obscura* as an omnivore. Insects also occurred most frequently in *Erpetoichthys calabaricus* (60%) and *Xenomystus nigri* (100%), as earlier been found by Tetsola (1988) and Odum (1992). Welcomme (1979) recorded *X. nigri* to be a aufwuchs browser. The cichlid *Hemichromis fasciatus* is more of insectivorous predator (100%) in Jamieson River, the same as the conclusion of Odum (1992) in Ethiope River that it fed frequently on fish (66.67%) and shrimps (66.67%) relates it to the findings of Adebisi (1981) and Tetsola (1988). Tetsola (1988) and Odum (1992), in buttressing up this study, already classified *H. bimaculatus* as an omnivore. It fed on algae (100%), macrophytes (50%), detritus (60%), insects (80%), shrimps (60%) and fish (60%). The bagrid catfish *C. furcatus* was classified as a bottom feeder in River Niger (Imevbore and Bakare, 1970). Umeh (1987) observed it to feed on algae, detritus and insect larvae in River Ase where he described it as a bottom feeder. In this study, it was observed to consume several food organisms probably picked up from Jamieson River bottom and the water column. *C. nigrodigitatus* exhibited a more generalized feeding strategy. However, Tetsola (1988) and Odum (1992) rated it as a planktivore, contrary to Brown (1985) and Umeh (1987) who regarded it as an omnivore. The present study supports the latter two workers just like Welcomme (1979) who classified all generalized predators as omnivores.

Conclusion

The fish fauna is consisted of a multi-species (34.78%) family Cichlidae, a trio (13.04%) family Bagridae, 3 dual species (8.70% each) families, Mochokidae, Mormyridae and Notopteridae, and 6 single – species (4.35% each) families Channidae, Characidae, Clariidae, Phractolaemidae, Polypteridae and Schilbeidae. Food items selected determinatively by fish size and visual cues efficiency, possibly constituted the stomach contents in the Jamieson River fish species. It is seemingly clear that fish exhibited no restriction to a particular depth for feeding purpose because they evidently obtained food items from the water column and the river bottom indicating the omnivorous feeding habit.

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