

Full Length Research Paper

Parasites of landed fish from Great Kwa River, Calabar, Cross River State, Nigeria

Ekanem A. P.^{1*}, Eyo V. O.¹ and Sampson A. F.²

¹Department of Fisheries and Aquaculture, University of Calabar, Nigeria.

²Department of Marine Biology, University of Calabar, Nigeria.

Accepted 21 October, 2011

Parasites of landed fish from the Great Kwa River, Calabar, Cross River State, Nigeria were studied. Parasitological examination of 180 fish samples belonging to 9 taxa from the River showed 50% incidence for *Chrysichthys nigrodigitatus*, 16.67% for *Heterotis niloticus*, *Clarias gariepinus* and *Tilapia galileaus* respectively and 0% for *Hepsetus odoe*, *Arius gigas*, *Momyrus rume*, *Ethmalosa fimbriata* and *Cynoglossus senegalensis*. Parasite infestations were found in the stomach and intestine, and no parasites were found on the fins, skin and gills. Nematodes, cestodes and protozoan were found in decreasing order of abundance. *Diphyllobothrium* sp. was found in the intestine of *C. nigrodigitatus*; *Camallanus* sp. was found in the intestine of *H. niloticus* and *T. galileaus* while protozoan cysts were found in the intestine of *C. gariepinus*. Parasites were more prevalent in the fish of 30 to 39.9 cm total length size range. The study determined that in the Great Kwa River the preferred organs of parasites were the intestines and stomach.

Key words: Parasites, landed fish, Great Kwa River.

INTRODUCTION

Fish are important source of income and food in Nigeria and other countries in the sub-Saharan Africa, where some 35 million people depend wholly or partly on the fisheries sector for their livelihood (FAO, 1996). In Nigeria, consumption and demand for fish protein is increasing due to its affordability. Parasites play an important role in the ecology of aquatic ecosystems as well as in the aqua - and mariculture industries. Apparently, the origin of most diseases in mariculture is likely to be the wild-caught fingerlings or juvenile fish (Martens and Moens, 1995). In Nigeria, the vast majority of the supply of fish comes from river systems where fish are landed at fishing jetties and purchased for distribution by large and small scale fish dealers.

Parasites of fish are a concern since they often produce a weakening of the host's immune system thereby increasing their susceptibility to secondary infections, resulting in the nutritive devaluation of fish and subsequent economic losses (Onyedineke et al., 2010). In fish culture systems, parasites have often been implicated as the main cause of economic losses (Khalil and Polling, 1997) and parasite species found to cause none or limited pathological damage in wild fish may, under conditions of mariculture, become pathogenic (Diamant and Paperna, 1986; Overstreet, 1978). The possibility of disease transmittal from fish to humans through fish consumption is a public health concern (Ibiwoye et al., 2006). Kabata (1985) reported that *Clinostomum* (Acanthocephalans) when ingested with poorly cooked fish is capable of producing laryngoharyngitis which is an unpleasant inflammatory condition. Parasite infection of the body cavity and the

*Corresponding author. E-mail: albertekanem@yahoo.com.

musculature of fishes have been reported as presenting marketing problems for commercially exploited species (Petersen et al., 1993). For instance, heavy infestation of the Alaska Pollack *Theragra chalcogramme* with plerocercoid of *Nybelinia surmenicola* has reduced the consumable part of the fish to the dorsal musculature (Grabda, 1977). Similarly, infestation with plerocercoids of *Gymnorhynchus thyrstae* has seriously affected the exploitation of the highly valued *Thyrstae atun* in New Zealand (Mehl, 1970).

The Great Kwa River is one of the major tributaries of the Cross River Estuary. It takes its rise from the Oban Hills in Nigeria, flows southwards and discharges into the Cross River Estuary around latitude 4°45'N and longitudes 8°20'E (Akpan, 2000). With increasing population pressure associated with the Export free zone status of Calabar, human settlement and industrial layouts are expanding rapidly into the freshwater and mangrove swamps of the Great Kwa (Akpan, 2000). Important fish species are, for example, bonga, *Ethmalosa fimbriata* and the estuarine catfish, *Chrysichthys nigrodigitatus* while the main shrimp species are *Macrobrachium macrobrachion*, *Macrobrachium vollenhoevenii*, *Penaeus notialis* (post larval stages), *Nematopalaemon hastatus*, *Parapenaeopsis atlantica* and *Exhippolysmata hastatoides* (Holzlöhner, 1996).

Various studies have been carried out on fish parasites from different bodies of water in Nigerian (Ekanem, 2010; Obiekizie, 1995; Ekanem and Obiekizie, 2000; Onwuliri and Mgbemena, 1987; Anosike et al., 1992; Ezenwaji and Ilozumba, 1992; Aken'ova, 1999; Auta et al., 1999; Okaka, 1999; Emere, 2000; Ibiwoye et al., 2000, 2004; Olurin and Somorin, 2006; Akinsanya et al., 2007). This study investigated the parasites of landed fishes from the Great Kwa River in Calabar and the possible health implications to fish consumers.

MATERIALS AND METHODS

Study area

The Great Kwa River is one of the major tributaries of the Cross River Estuary. It takes its course from the Oban Hills in Aningeje, Cross River State, Nigeria which flows southwards and discharges into the Cross River Estuary around latitude 4°45'N and longitude 8°20'E (Akpan, 2000). The lower reaches of the river drain the eastern coast of the Calabar municipality, the capital of Cross River State of Nigeria (Figure 1).

Field sampling

A total of 180 fish specimen belonging to 9 taxa were collected from the study area in a period of four months (5 specimens monthly for

each taxa). The fish were collected with the aid of fishers using gill, lift and, cast nets, as well as wire and basket traps of various mesh sizes. A combination of capture methods were employed to get all sizes of the target species. Sampling was carried out in the main river channel and fish were transported to the Fisheries and Aquaculture Laboratory, University of Calabar, for identification and examination.

Examination of samples for ectoparasites

Scrapings from the fins, skin and gills of the fish specimen were smeared on clean glass slides, covered with cover slides and examined under light microscopes for ectoparasites. Some parasites were collected and fixed in 4% phosphate buffered formalin (PBF) for further processing and species identification (Paperna, 1980; 1996). Each sample was examined independently for parasites according to the protocol outlined in Obiekizie and Ekanem (1995). Skin scrapings and wet mounts from fins, skin and gills were examined for abundance and distribution of ectoparasites. Identification of parasites was carried out according to Yamaguti (1961), Roberts (2000), Obiekizie and Engenihi (1988) and Obiekizie and Ekanem (1995).

Examination of samples for endoparasites

The cavity of each fish was cut opened ventrally with a pair of scissors and the internal organs removed for examination. Organ squash of some organs (liver, spleen, heart, kidney) were made and examined as wet mounts under the microscope while other parts were fixed in PBF for isolation, and identification of parasites ((Paperna, 1980, 1996).

Determination of percentage incidence of fish parasites

The percent incidence of both ecto- and endoparasite were calculated according to Tombi and Bilong (2004).

$$\text{Percentage incidence (\%)} = (n/N) \times 100$$

Where, n is the number of individual parasites species isolated, N is the total numbers of parasites isolated from individual fish.

RESULTS

Of one hundred and eighty fish samples examined in 9 taxa, only 4 species were infested with parasites including: *Heterotis niloticus*, *Chrysichthys nigrodigitatus*, *Clarias gariepinus* and *Tilapia galilaeus*. The parasites recovered were endoparasites including nematodes (round worm), cestodes and protozoans, all of which were found in the fish stomach and intestine. Table 1 shows fish species examined and the number infested.

Percentage incidence (Table 2) of parasites of fish examined shows that *H. niloticus* had 16.67%, *C. nigrodigitatus* (50.0%), *C. gariepinus* (16.67%), *T. galilaeus* (16.67%) respectively.

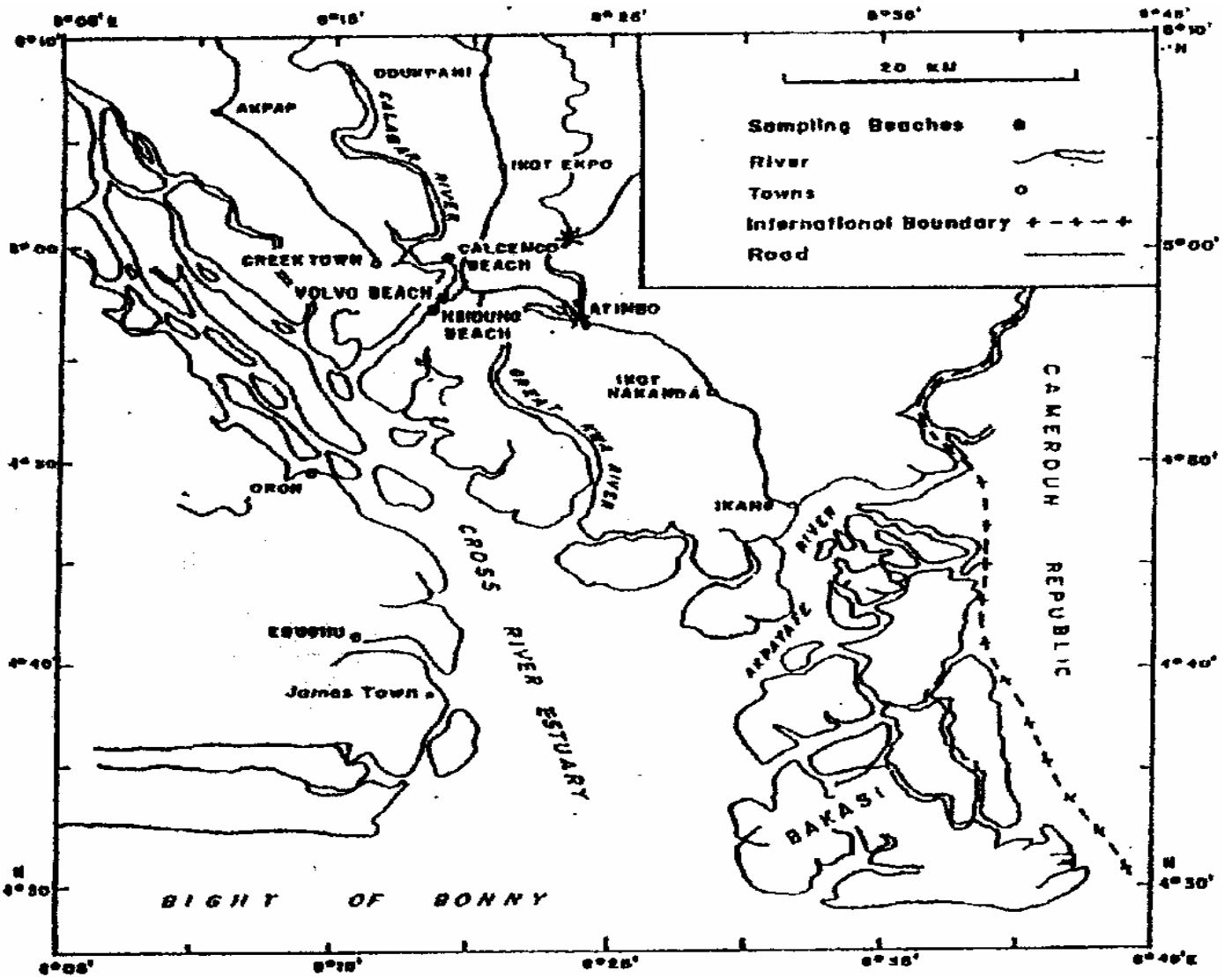


Figure 1. Showing study area.

Numerical abundance of parasites of fish examined

Numerical abundance of parasites (Table 3) revealed that a total of 10 species of parasites occurred in the landed fish examined; 2 in *H. niloticus*, 5 in *C. nigrodigitatus*, in *C. gariepinus* and 1 in *T. gallilaeus*. No parasite occurred in *H. odoe*, *A. gigas*, *M. Rume*, *E. fimbriata* and *C. senegalensis*. *H. niloticus* was infested with one nematode (*Camallanus*) found in the intestine and one cestode (*dipyllobortmium*) found in the stomach; *C. nigrodifitatus* was infested with two nematodes (*Camallanus*) in the stomach and intestine, two cestodes (*Diphyllobortmium*) in the intestine and one protozoan

cyst in the intestine. *C. gariepinus* examined had a total of 2 parasites which were roundworm (*Camallanus*) in the intestine while *T. gallilaeus* had one protozoan cyst is the intestine.

Prevalence of parasites In relation to fish standard length (cm)

The prevalence of parasites of landed fish (Table 4) showed that parasites were most prevalent in *C. nigrodifitatus* in length Class 20-29.9 cm with 4 parasites followed by *C. gariepinus* in length class 20-29 cm with 2

Table 1. Fish species examine and number Infested.

Fish species	Number examined	Number infested
<i>Heterotis niloticus</i>	20	1
<i>Chrysiichthys nigrodigitatus</i>	20	3
<i>Hepsetus odoe</i>	20	0
<i>Arius gigas</i>	20	0
<i>Momyrus rume</i>	20	0
<i>Etmalosa fimbriata</i>	20	0
<i>Cynoglossus senegalensis</i>	20	0
<i>Clarias gariepinus</i>	20	1
<i>Tilapia galilaeus</i>	20	1
Total	180	6

Table 2. Percentage incidence of parasites.

Fish species	Number infested	% Incidence
<i>Heterotis niloticus</i>	1	16.67
<i>Chrysiichthys nigrodigitatus</i>	3	50.00
<i>Clarias gariepinus</i>	1	16.67
<i>Tilapia galilaeus</i>	1	16.67
Total	6	100

Table 3. Numerical abundance of parasites of landed fish from the Great Kwa River. (G = Gills, F=Fin, Sk =Skin St = Stomach, I = Intestine).

Fish species	Nematode					Cestode					Protozoan cyst					Total
	G	F	SK	ST	I	G	F	SK	ST	I	G	F	SK	ST	I	
<i>H. niloticus</i>	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	2
<i>C. nigrodigitatus</i>	0	0	0	1	1	0	0	0	0	2	0	0	0	0	1	5
African pike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Marine catfish	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>M. rume</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>E. Fimbrata</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cynoglossus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>C. gariepinus</i>	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
<i>T. galilaeus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Total	0	0	0	1	4	0	0	0	0	3	0	0	0	0	2	10

parasites and *H. niloticus* in length class 30 to 39.9 cm with 2 parasites each while *C. nigrodigitatus* of length class 30-39.9 cm and *T. galilaeus* in length class 10 to 19.9 cm showed the lowest prevalence.

DISCUSSION

Results obtained from the present study shows a low

infection rate of about 3.33% in fish genera examined, with all recovered parasites being endoparasites; nematodes, protozoan and cestodes. The only species of fish infested were *H. niloticus*, *C. nigrodigitatus*, *C. gariepinus* and *T. galilaeus*. The present study revealed that *C. nigrodigitatus* had the highest percent incidence of the infested fishes, while no incidence of ectoparasite and endoparasite was recorded in *H. odoe*, *A. gigas*, *M. rume*, *E. fimbriata* and *C. senegalensis*. This is similar to

Table 4. Prevalence of parasites in relation to fish standard lengths (cm) in a) *Heterotis niloticus*, b) *Chrysichthys nigrodigitatus* c) *Clarias gariepinus* and d) *Tilapia galilaeus*.

Standard length (cm)	No. and % of fish examined	No. and % of fish infested	Total No. and % of parasites recovered
<i>Heterotis niloticus</i>			
10 – 19.9	4(20)	0(0.0)	0(0.0)
20 – 29.9	10(50)	0(0.0)	0(0.0)
30 – 39.9	6(30)	1 (100.0)	2(100.0)
Total	20(100)	1(100.0)	2(100.0)
<i>Chrysichthys nigrodigitatus</i>			
10 – 19.9	8(40)	0(0.0)	0(0.0)
20 – 29.9	8(40)	2(66.67)	4(80.0)
30 – 39.9	4(20)	1 (33.33)	1(20.0)
Total	20(100.00)	3(100.00)	5(100.0)
<i>Clarias gariepinus</i>			
10 – 19.9	4(20)	0(0.0)	0(0.0)
20 – 29.9	6(30)	0(0.0)	0(0.0)
30 – 39.9	10(50)	1(100)	2(100)
Total	20(100)	1(100)	2(100)
<i>Tilapia galilaeus</i>			
10 – 19.9	14(70)	1(100.0)	1(100)
20 – 29.9	6(30)	0(0.0)	0(0.0)
30 – 39.9	0(0.0)	0(0.0)	0(0.0)
Total	20(100.0)	1(100.0)	1(100)

the low infection rate (13.6%) reported elsewhere in Imo River (Ugwuozor, 1987). The low infestation rate in these fishes could be attributed to the sanitary condition of the river, the location of the river from residential areas, number and class of people visiting the river and their purposes. Number of nematodes isolated was higher than cestodes, and protozoans. Nematodes are known to occur in body cavities or found penetrating subcutaneous tissues. Host specificity of nematodes agrees with the findings of Akinsanya et. al., (2007). Ukoli (1965); Olurin and Somorin (2006) recovered *Clinostomum* sp from the intestines of tilapia fishes. In the present study, *Clinostomum* was not found parasitizing cichlid species (*T. Galilaeus*) and non-cichlid species such as *H. niloticus*, *C. nigrodigitatus*, *H. odoe*, *A. gigas*, *M. rume*, *E. fimbriata*, *C. sensgalensis* and *C.gariepinus*.

Kabata (1985) reported that *Clinostomum* (Acanthocephalans) when ingested with poorly cooked fish is capable of producing laryngopharyngitis which is an unpleasant inflammatory condition in man. No Acanthocephalans were found in the intestine of the examined fish which disagrees with the findings of

Awachie (1965) and Olurin and Somorin (2006) in fishes from Kainji Lake and Owa stream respectively. A Higher number of parasites were found in the intestines than other organs which could be associated with the fact that most digestive activities take place in the intestine resulting in the release of parasite ova/cysts in food particles. No parasite was found on the gills, skin and fins and this observation could be attributed to the continuous movement of water current over the gills skin and fins which may not encourage anchoring and survival of parasites on such locations. Comparing the prevalence of parasites in relation to length classes for all the species, 30-39.9cm (standard length) recorded the highest number of parasites recovered. This might be attributed to large amount of food intake by the animals. However, *C. nigrodigitatus* of length class 20-29.9cm recorded the highest prevalence of parasitic infestation when the species were compared individually.

In conclusion, although low incidence of landed fish parasites were recorded in the Great Kwa River, landed fish from this location should be properly cooked to avoid ingestion of parasites by fish consumers.

REFERENCES

- Aken'ova TO (1999). Helminth infection of the gills of *Clarias* species in Zaria, Nigeria. *J. Parasitol.* 20: 113-121.
- Akinsanya B, Otubanjo OA, Hassan AA (2007). Helminth parasites of *Malapterurus electricus* Malapteruridae from Lekki Lagoon, Lagos, Nig. *J. Am. Sci.* 3(3): 1-5.
- Akpan ER (2000). Influence of Meteorological and Hydrographic factors on the water quality of Calabar River, Nigeria. *Trop. Environ. Res.* 2(1): 101-111.
- Anosike JC, Omoregie E, Ofojekwu PC, Nweke IE (1992). A survey of helminth parasites of *Clarias gariepinus* in plateau State, Nig. *J. Aqua. Sci.* 7: 39-43.
- Autu J, Onye SJ, Adakole JA (1999). The helminth parasites of the gastro-intestinal tract of *Synodontis* species in Zaria, Nig. *J. Aqua. Sci.* 2: 47-53.
- Awachie JBE (1965). Preliminary notes on the parasites of fish in the area of Kainji reservoir in the first scientific report of the Kainji Biological Research Team. Edit White Liverpool: Biological research team, Kainji, pp. 65-69.
- Diamant A, Paterna I (1986). The Parasites of Wild Red Sea rabbitfish (*Siganus* spp.) (Teleostei Perciformes) as Potential pathogens in mariculture. In: Pathology in Marine Agriculture (Els C. P. Vivares et al). *Spec. Publ. Eur. Aquacult. Soc.*, 9: 71-83.
- Ekanem D, Obiekezie AI (2000). Antiparasitic effects of piperquine (Husaini) on the Juvenile of *Heterobranchus longifilis* (Cuvier & Valenciennes). *Afr. J. Fishers Aquacult.*, 2: 68-74.
- Ekanem AP (2010). Incidence and abundance of trichodiniasis of *Clarias gariepinus* in the University of Calabar fish farm, Calabar, Nigeria. *Trop. Environ. Res.* 9: 566-570.
- Emere MC (2000). Parasitic infection of the Nile perch *Lates niloticus* in river Kaduna. *J. Aqua. Sci.*, 15: 51- 54.
- Ezenwaji HMG, Ilozumba PCO (1992). Helminth fauna of four West African small *Clarias* species (Osteichthys: Clariidae) from Nigeria. *J. Afri. Zoo*, 106: 391-400.
- FAO (1996). Aquaculture potential in African Documentation issued on the occasion of the World Food Summit in Rome November 1996. Rome FAO, p. 20.
- Grabda J (1970). Studies on parasitism and consumability of Alaska Pollack, *Theragra chalcogramm*.
- Holzlohner S. (1996): Ecology and fishery in the Cross River Estuary – a research project. 13th Annual Conference of the Nigerian Fisheries Society (FISON), 3-8 November, New Bussa, p. 9.
- Ibiwoye TII, Okaeme AN, Balogun AM, Ogunsusi RA (2000). Updating the helminth parasites fauna of freshwater fishes in Nigeria in the new millennium. First occurrence of *Eustrongyloides africanus* (Khalil and Thurston, 1973) larvae in *Clarias* species of Nigeria. 15th Annual conference of the Fishes Society of Nigeria (FISON) Jos, Plateau State. 19-24th March.
- Ibiwoye TII, Owolabi OO, Ajala AA, Oketoki TO, Adio SM, Adedapo AO, Ajeka PO, Agbontale JJ (2006). Helminth Parasites in freshwater fish species from Jebba Lake and Bida Flood Plain Area of River Niger, Nigeria. Proceedings of the 21st Annual Conference of the Fisheries Society of Nigeria (FISON), Calabar, 13th-17th November, 2006. pp. 13-20.
- Kabata Z (1985). Parasites and diseases of fish cultured in the tropics. Taylor and Francis, London, p. 318.
- Khalil LF, Polling K (1997). Checklist of the African Freshwater Fishes. University of the North Department of Zoology. Republic of South Africa, p. 189.
- Martens E, Moens J (1995). The metazoan ecto-and endoparasites of the rabbitfish, *Siganus sutor* (Cuvier and Valenciennes, 1835) of the Kenyan Coast.
- Mehl JA (1970). Two flesh parasites of barracouda (Teleostei: Gempylidae) from eastern coast strait N. Z. *J. Mar. Fw. Res.* 3: 241-247.
- Obiekezie AI, Enyenihi UK (1988). *Henneguya Chrysichthys* Sp. Nov (Protozoa: myxozoa) from the gills of the estuarine catfish, *Chrysichthys nigrodigitatus* (Lacepede) in the Cross River Estuary Nigeria. *J. Afr. Zool.*, 102: 33-42.
- Obiekezie AI, Ekanem D (1995). Experimental infection of *Heterobranchus longifilis* (Teleostei: Clariidae) with *Trichodina maritinkae* (Ciliophora: Peritrichida). *Aqua. Liv. Res.*, 8: 439-443.
- Obiekezie AI, Moller H, Anders K (1998). Diseases of the African estuarine Catfish *Chrysichthys nigrodigitatus* (Lacepede) from the Cross River estuary, Nig. *J. Fish Bio.*, 32: 207- 221.
- Obiekezie AI (1995). Chemotherapy regimens for diseases management in the nursery phase of African catfishes (clariidae) (Ext.Abstr.) First African fisheries Congress (Fish '95), July 31-August, 5. Narroby Kenya.
- Okata CE (1999). Helminth parasites of some tropical freshwater fish from Osse River in Benin, southern Nigeria. *Trop. Fw. Bio.*, 8: 41-48.
- Olurin KB, Somorin CA (2006). Intestinal Helminths of the fishes of Owa stream, south-western Nigeria. *J. Fish. Hydrobiol.*, 1: 6-9.
- Onwuliri COE, Mgbemena MO (1987). The parasitic fauna of some freshwater fish from Jos plateau, Nigeria. *Nigeria. J. App. Fish. Hydrobiol.*, 2: 33-37.
- Onyedineke NE, Obi U, Ofoegbu PU, Ukogo I (2010). Helminth Parasites of some Freshwater Fish from River Niger at Illushi, Edo State, Nig. *J. Am. Sci.*, 6(3): 16-21
- Overstreet RM. (1978). Trypanorhynch Infection in the flesh of sciaenid fishes. *Mar. Fish. Rev.*, 40: 37-38.
- Paperna I (1996). Parasites infections and disease of fishes in Africa. CIFA Technical paper no. 31 food and agriculture organization, Rome.
- Paperna I (1980). Parasites, infection and disease of fishes in Africa. CIFA Technical paper.
- Petersen F, Palm H, Moller H, Cuzi M (1993). Flesh parasites of fish from central Philippine waters. *Dis. aquat. Org.*, 15: 81-86.
- Roberts RJ (2000). Fish pathology. 3rd edition. Hagerman, Idaho, p. 472.
- Tombi J, Bilong CF (2004). Distribution of gill parasites of the Freshwater fish *Barbus martarelli* Roman, 1971 (Teleostei: Cyprinidae) and Tendency to inverse intensity evolution between myxosporidia and management as a function of the Host Age.
- Ugwuzor GN (1987). A survey of helminth parasites of fish in Imo River. Nigeria. *J. fish Hydrobiol.*, 2: 23- 30.
- Ukoli FMA (1965). Preliminary report on the helminth infection of fish in the river Niger- Shagunu. In: White E. Ed. First Scientific Report of the Kainji Biological Research team. Liverpool Biol. Res. team, Kainji, p. 70-73.
- Yamaguti S (1961). Nematodes of Vertebrates. *Sys. Helminth.* New York, Interscience publishers Inc., 1: 2-61.