AFRREV STECH
An International Journal of Science and Technology
Bahir Dar, Ethiopia

Vol. 2 (1) January, 2013:83-93

ISSN 2225-8612 (Print) ISSN 2227-5444 (Online)

Capillariasis in *Chrysicthys Nigrodigitatus* (Catfish), *Cynoglossus Senegalensis* (Sole) and *Pseudotolthus Elongatus* (Bobo Croaker) from Cross River Estuary and Adjacent Coastal Waters

Abraham, J. T., Ndome, C. B., Okon, O. E., Ekpenyong, E. & Ibor, C. I.
Department of Biological Sciences, Cross River University of Technology, Calabar, Cross River State Nigeria
E-mail: efficientebong@yahoo.com

Abstract

A total of 400 sample each of Chrysichthys nigrodigitatus, Cynoglossus senegalensis and Pseudotolitus elongatus from Cross river estuary and adjacent coastal waters were examined for Capillaria species using parasitological techniques. 237 (59.3%) 85 (21.3%) and 68 (17.0%) respectively of the 3 fish examined were infected by Capillaria. Monthly

prevalence of Capillaria ranged between 15.6% to 100%, 0.0 to 34.1% and 9.0 to 43.2% respectively. Intensity range from 2 to 4, 0 – 3 and 2 to 3 were observed. Hyperytrophy of the ovarian, tissue of C. senegalensis was observed. Histological examination of the intestine of C. nigrodigitatus revealed alteration in the columinar nature of the epithelium which assumed squamous shape. Brunner's gland was dilated and laminar propria grossly distorted. Generally, infected fish appeared weak and emaciated.

Introduction

Capillariasis is a disease caused by nematode of the genus *Capillaria* which usually inhabits the intestine of fish, fish eating birds and man. In severe infection it may be found embedded in intestinal contents or intestinal mucosa. Klinger and Francis –Floyd (2002) and Reed *et al.*, (2002) described *Capillaria sp* as one of the three common nematodes infecting fish.

Three species of *Capillaria* are known to infect various animals. These are *Capillaria phillippinense*, *Capillaria hepatica* and *Capillaria aerophila*. C. *phillippinenses* inhabits the intestine of vertebrates causing intestinal capillariasis. Sign and symptoms of the infection include severe abdominal pains and diarrhea. Protein losing enteropathy can develop resulting in cachexia and death. *Capillaria hepatica* resides in the liver causing hepatic capillariasis. Symptoms include acute or sub acute hepatitis with eosinophilia which may spread to other organs. *Capillaria aerophilia* resides in the lungs causing pulmonary capillariasis. Diagnosis of the infections is recovery of eggs, larva and or adult worm in feaces. Biopsy of the liver and lungs may be necessary for recovery of adult worm in infected organ.

Intestinal parasitic infection has remained an important cause of morbidity and mortality of fishes in developing countries. Sources of transmission of such infection included direct transfer of live ova or cyst from feces, soil or anal canal to mouth, eating unwashed fruits and vegetables, eating and drinking of contaminated food and drinks. Fish may contact the infection through meals ingested along with contaminated water. Man may be infected by the parasite when fish carrying the infection is eaten.

This research aims at investigating the prevalence, intensity and histopathology of *Capillaria sp* in three major fish species, *Chrysichthys niqrodigitatus*, *Cynoglossus senegalensis* and *Pseudotolithus elongatus*, caught in Cross river estuary and adjacent coastal waters.

Materials and methods

Sample collection

Four hundred samples each of *Chrysichthys niqrodigitatus*, *Cynoglossus senegalensis* and *Pseudotolithus elongatus* were collected from fish traders and fishers in fishing villages located at landing ports along the banks of Cross river estuary and adjacent coastal waters and were immediately transported to the laboratory for examination.

Examination of samples

The fish belly was spilt open with the aid of a pair of forceps and knife. Gut contents were removed by means of spatula into Petri dishes and examined using double wet smear (cheesbrough, 2005).

A drop of saturated saline was mixed with iodine on a slide. A section of sample obtained from the gut was then spread evenly throughout the drops of iodine stain and saturated saline. A cover slip was carefully lowered on the slide and viewed under the compound microscope.

Histopathogical preparation of samples

Samples were fixed in Bouins fluid for 7 days. Fixed sample were dehydrated in ascending grades of absolute ethanol (30, 50, 70, 90 and 100%). Dehydrated samples were cleared in equal mixture of chloroform and xylene (1:1) for 2 hours. Cleared samples were impregnated, molded, blocked out and thin sections of 10pm cut with rotary microtome. Cut sections were picked on albumenized slide, stained with Harris haematoxylin, mounted in Canada balsam and examined with light microscope.

Data analysis

Prevalence of infections was determined by the ratio of infected samples (fish) to the total number of samples examined expressed in percentage.

Results

A. *Chrysichthys nigrodigitatus*

Two hundred and thirty seven (59.3%) of the 400 samples examined were infected by *Capillaria sp.* Infected fish appeared weak and emaciated. Monthly prevalence ranged between 15.6% in March and 100% in September (table 1). Among different length class (age), 61-70am and 11-20cm had the

highest (96.0%) and lowest (37.3%) prevalence respectively (table 2). 67 (16.8%) and 170 (42.5%) of all *Chrysichthys* were males and females respectively (table 2). Ninety four (39.7%) and 143 (60.3%) of all recorded cases (237 cases) were observed in dry and wet seasons respectively (figure 1). Comparison of dry and wet season variation in prevalence amongst male and female fish using t-test showed significant difference at P>0.05.

Table 1: Monthly prevalence and intensity of *Capillaria sp* in *Chrysichthys nigrodigitatus*, *Cynoglossus senegalensis* and *Pseudotolithus elongatus* from Cross river estuary and adjacent coastal waters

Month	**No of fish examined**	**No (% Prevalence) of fish infected fish**			**Monthly intensity (parasite/kg)**		
		C.n	C.s	P.e	C.n	C.s	P.e
Feb	44	22(50.0)	0(0.00)	6(13.6)	2	0	3
March	45	15(15.6)	7(15.6)	12(27.3)	2	1	2
April	44	25(56.8)	15(34.1)	12(26.7)	2	1	2
May	44	30(68.2)	10(22.7)	19(43.2)	3	2	3
June	46	30(65.2)	14(31.1)	7(15.9)	3	2	2
July	44	34(77.3)	13(28.9)	6(13.3)	4	2	2
Aug	22	13(81.8)	3(13.6)	2(9.0)	4	2	2
Sept	22	22(100.0)	3(13.6)	2(9.0)	4	2	2
Oct	22	14(63.6)	3(13.6)	2(9.0)	3	3	3
Nov	23	13(56.5)	5(21.7)	2(9.0)	2	1	2
Dec	22	9(40.9)	6(27.3)	3(13.0)	3	1	3
Jan	22	9(40.9)	6(27.3)	3(13.0)	3	1	3
∑	400	237(55.5)	85(21.3)	68(16.8)	31	18	29

C.n-*Chrysichthys nigrodigitatus*

C.s-*Cynoglossus senegalensis*

P.e-*Pseudotolithus elongatus*

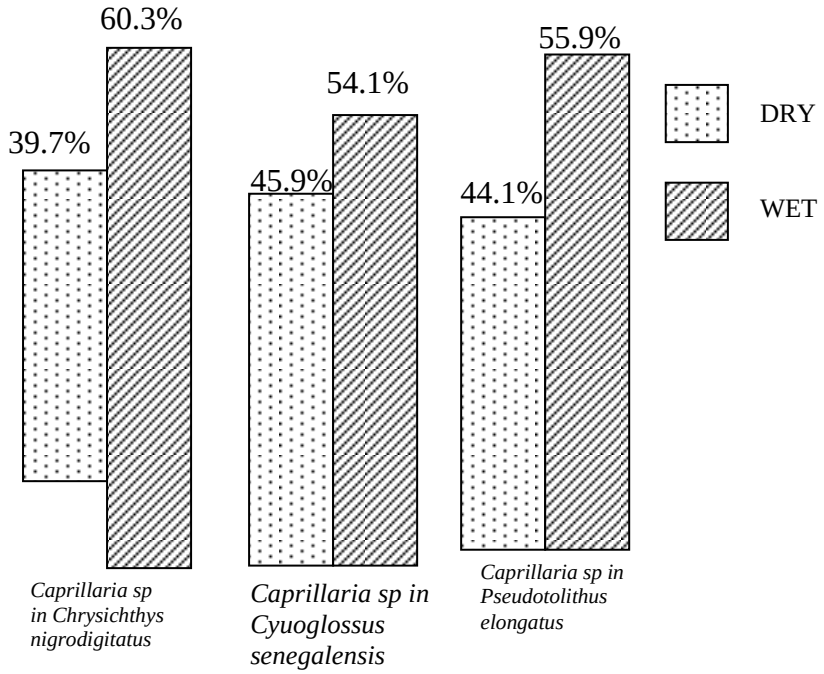
Parasite intensity/burden ranged between 2 parasites per kilogram and 4 parasites per kilogram (table 1).

Histological examination of the intestine of samples revealed alteration of columnar nature of the epithelium which assumed a squamus structure. Brunners gland was dilated while laminar priopria was grossly distorted making the various sections of the intestine appeared lose. Thus, the fish appeared weak and emaciated.

Table 2: Prevalence and intensity of *Capillaria sp* in different length class of *Chrysichthys nigrodigitatus*

Length class (cm)	No of fish examined			No (% prevalence) of fish infected			Mean intensity (par/kg)
	Male	Female	Total	Male	Female	Total	
11-20	40	70	110	3(2.7)	38(34.5)	41(37.3)	2
21-30	31	52	83	10(12.0)	36(45.8)	46(55.4)	2
31-40	36	44	80	12(15.0)	33(41.3)	45(56.3)	4
41-50	18	22	40	14(35.0)	21(52.5)	35(87.5)	4
51-60	15	18	33	10(3,.0)	20(60.6)	30(90.9)	4
61-70	10	15	25	9(36.0)	10(40.0)	19(96.0)	3
71-80	7	8	15	7(46.7)	6(40.0)	13(86.7)	3
81-90	5	9	14	2(14.3)	6(42.9)	8(57.1)	2
TOTAL	162	238	400	67(16.8)	170(42.5)	237(59.3)	

Figure 1: Seasonal variation in prevalence of *Caprillaria* infection in *Chrysichthys nigrodigitatus*, *Cynoglossus senegalensis* and *Pseudotolithus elongatus*



B. *Cynoglossus senegalensis*

Adult *Capillaria* were recovered from lumen of the intestine of *Cynoglossus senegalensis*. Eighty five (21.3%) of all samples examined had the parasite. Monthly prevalence ranged between 0.0% in February and 40.9% in January (table 1). Highest prevalence (37.5%) and lowest prevalence (10.9%) were observed in fish length (age) 41.50cm and 11-20cm respectively (table 3).

Male and female fish had 9.0% and 12.3% prevalence respectively while 54.1% and 45.9% prevalence were observed in wet and dry season respectively (figure 1). Comparison of dry and wet seasons and male and female variation using t-test showed significant difference at P>0.05.

Parasite intensity/burden ranged between 1 parasites per kg and 3 parasites per kilogram (table 1). A somatic proliferation (hypertrophy) was observed in the ovarian tissue of some infected *C. senegalensis*.

Table 3: Prevalence and intensity of *Capillaria sp* in different length class of *Cynoglossus senegalensis*

Length class (cm)	No of fish examined			No (% prev.) of fish infected fish			Mean intensity (par/kg)
	Male	Female	Total	Male	Female	Total	
11-20	42	50	92	4(4.3)	6(6.5)	10(10.9)	1
21-30	53	67	120	12(10.0)	15(12.5)	27(22.5)	1
31-40	69	71	140	12(8.6)	18(12.9)	30(21.4)	3
41-50	18	30	48	8(16.7)	10(20.8)	18(37.5)	2
∑	182	218	400	36(9.0)	49(12.3)	85(21.3)	7
							~~x~~= 7/**7** =1

C. *Pseudotollthus elongatus*

Capillaria sp was isolated from the intestine of the fish. 68 (16.8%) of all *Pseudotolithus elongatius* examined had the infection. Lowest monthly prevalence (9.1%) was observed in August, September, October and November while highest prevalence (43.2%) was observed in May (table 1). Prevalence of *Capillaria* at different length (age) of *Pseudotolithus elongatus* ranged from 10.9% to 37.5% in 11-20cm and 41-50cm respectively. 54.5% and 45.5% of all observed cases were constituted by female and male fish respectively (table 4) while 55.9% and 44.1% were recorded in wet and dry seasons respectively (figure 1). Comparison of variations in number of male and female cases using t-test showed significant different at P>0.05. Parasite intensity ranged between 1 parasite per/kg and 3 parasites /kg.

Table 4: Prevalence and intensity of *capillaria sp* in different length class of *Pseudotolithus elongatus*

Length class (cm)	No of fish examined			No (% prevalence) of infected fish			Mean intensity (par/ml)
	M	F	Total	M	F	Total	
11-20	79	81	160	0(0.0)	0(0.0)	0(0.0)	-
21-30	43	45	88	4(4.5)	2(2.3)	6(68.0)	3
31-30	37	44	81	9(11.1)	18(22.2)	27(33.3)	2
41-50	20	21	41	6(14.6)	10(24.4)	16(39.0)	2
51-60	12	18	30	8(26.7)	11(36.7)	19(63.3)	2
∑	191	209	400	27(6.5)	41(10.3)	68(16.8)	$\bar{X}$=9/4=2.25

Discussion

The ability of *Capillaria* to infect more than one fish species is an indication, not only of its wide adaptive tendency but also its wide salinity tolerance. *Capillaria* may be highly fecund to allow for such wide adaptability. High fecundity of some parasite may increase their transmission. Widely adaptive trend of *Capillaria* was shown by fact that (continue over page) as already stated, monthly prevalence of the parasites in the 3 fish species studied varied and differences in monthly prevalence of the parasite in these fish were found to be significant at P>0.05. Moreso, lowest monthly prevalence (15.6%, 0.0% and 9.0% respectively) and highest monthly prevalence (100.0%, 40.9% and 43.2%) in the studied fish species indicated differences in parasite load carrying capacity of each fish and the degree of host preference by the parasite. Monthly prevalence of *Capillaria* in *Chrysichthys nigrodigitatus* increases from March to September, from February to April in *Cynoglossus senegalensis* and from August to November to May and remain constant between August November in *Pseudotolithus elongatus.* These trends indicated increased in prevalence as salinity decreased, rapid increased in parasite burden when salinity is high during dry season months and decreased in prevalence as salinity decreased respectively. Higher prevalence observed during wet season months could be due to increased sewage load in

Asuquo, 1989.

Comparative increase in parasite prevalence in favour of wet season months had earlier been advanced by Lukacoric *et al* (2005). Klinger and Francis Floyd (2002) attributed most fish problems to poor water quality, a condition experienced by fish in the study area during wet seasons. Prevalence of *Capillaria* observed among length groups (age) of the three fish species studied showed that fish below 11cm had no infection. 11-20cm had lowest prevalence while fish at 40cm length and above had highest infection except among infected *Pseudotolithus elongatus* that highest infection occurred at 21-30cm. Categorization of parasitic infection among different length of fish was earlier advanced by Abraham (2010). Infection among different length-at-age, were categorized as juvenile (11-30cm), maturing group (31-70cm) and matured group (70cm and above). Juveniles are more susceptible to infection but only few infected ones survived in natural environment (Klinger and Francis-Floyd, 2002). Those juveniles that survive parasitism are highly vulnerable to predators. The maturing group have well developed appendages and can explore almost all niches in the estuary. These expose them to greater risk of parasitic infection. Also, their tissues and organs offer better sites for parasitic development so that many parasites can survive in them. The matured group with decline in prevalence may have good and effective defensive mechanism and strategies to evade parasite infection, and can effectively detect areas of danger or areas where they could easily be infected by parasites.

More females of the examined samples had *Capillariasis* than males. Prevalence of the infection in different sexes of *Chrysichthys nigrodiqitatus* were 42.5% females and 16.8% males, 12:3% and 9.0% in *Cynoglossus senegalensis* and 54.5% and 45.5% in *Pseudotolithus elongatus*. Higher infection in 876 female fish may be accounted for by feeding habit, rselative abundance and habitat selection tendencies. Thomas (1964) suggested factors such as selection by the host fish, position in the social hierarchy and over dispersed nature of the transmission site to cause higher female parasitism. Other factors suggested included differences in immunity such as presence of testosterone, immune-suppression, corticosteroid-based immune suppression and differences between the size and behaviour of the sexes (Thomas, 1964) Research into normal and behavioural aspect of male and female fish in

Cross River Estuary and adjacent coastal waters is here encouraged as it may offer strong reasons for higher female parasitism.

Severe pathological effects were observed in *Chrysichthys* having parasite intensity of 4 parasites per kg. Some of the fish suffered alteration in the columnar nature of intestination epithelium. The cells assumed squamous shape instead columnar. Brunner's gland was dilated and laminar propria grossly distorted making the various sections of the intestine appeared lose. Infected *Cynoglossus senegalensis* with parasite intensity of 3 parasite/kg developed ovarian tissue hypertrophy. Alteration of the nature of intestinal epithetial cells of infected *Chrysichthys nigrodigitatus* and somatic proliferation (hypertronphy) of ovarian tissue of infected *cynoglossus senegalensis* may have been caused by slow metabolic activities due to Lessions and loose epithelial surface caused by *Capillaria.* Alteration of the shape of intestinal epithelial cells may result in delayed digestion, slow rate of absorption and inadequate supply of nutrients to tissues and organs of infected fish. These in turn may hinder oocyte development resulting in low fecundity of the infected fish (Abraham and Akpan, 2012).

The three fish species examined constitute major components in daily catch observed among fishers along the Cross River Estuary and adjacent coastal waters. The risk of transferring infection from infected fish to consumers (Zoonosis) cannot be overemphasized. Controlling the spread of Capillaria in particular and other fish diseases in vast water body such as Cross River Estuary and adjacent coastal waters may be difficult. However, by controlling exploitation, routine check and subsequent bath of catch (fish) 1% formalin solution by government agencies can ensure that fish presented for public consumption are free of *Capillaria* and other parasites.

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