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Prevalence and Intensity of *Contracaecum sp.* in Jew-Fish *(Otolithoides Pama)*

Priyanka Rani Naha, Mohammad Redwanur Rahman, Joyshri Sarker*, S. M. Rashadul Islam

Department of Aquaculture, Chattogram Veterinary and Animal Sciences University, Chattogram-4225, Bangladesh

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***Corresponding author:** Joyshri Sarker

Abstract **Original Research Article**

An investigation was made on the prevalence and intensity of *Contracaecum sp.* in *Otolithoides pama* from the Bay of Bengal from June 2017 to January 2018. In this experiment prevalence and intensity of parasite, monthly and seasonal distribution of parasite, a variation of the parasite in relation to fish size and distribution of parasite on different organs of pama croaker fish were observed. Fishes of every sampling were divided into four subgroups and the weights of the fishes were divided into six classes. In this experiment, a total of 2,149 parasites were extracted from 119 fish. Highest prevalence (100%) was observed in June (251 parasites from 20 fishes), September (183 parasites from 20 fishes), October (878 parasites from 20 fishes) and the lowest (11 parasites from 3 fishes) (15%) in August. The intensity was highest in October (43.9) and lowest in August (3.67). Prevalence, intensity and abundance were highest during autumn and lowest in the rainy season. The prevalence and intensity of infestation of *Contracaecum* sp. were significantly (P<0.5) different in different months. The highest prevalence 100% (1061 parasites from 40 fishes), intensity (73.25), abundance (73.25) were observed in larger weight fishes (151-170gm). The lowest prevalence was found in 91-110(gm) weight groups of fishes. In case of intensity and abundance, both were lower in 71-90(gm) weight groups of fishes. The *Contracaecum* sp. was mainly found in the body cavity (70.45±24.45) but some were extracted from the stomach, intestine, liver and pancreas of fish. The mean count of parasite was highest from body cavity (70.45±24.45) in the larger weight fishes. So, the present study determined that *O. pama* is highly prevalent to *Contracaecum* sp. in Chattogram region. This parasitological investigation in Sciaenid fish could helps to prevent the transmission of diseases to human and other animals.

Keywords: *Otolithoides pama*, *Contracaecum* sp., Prevalence, Intensity.

INTRODUCTION

Parasites usually influence the quality and marketing of commercially produced fish and may contribute to high fish mortalities and economic losses or threaten the abundance and diversity of fish species, accordingly, raising a lot of public health concerns, particularly in regions where raw or smoked fish are eaten [1, 2]. The study of parasitic fauna of marine fishes is very important to understand the host-parasite relationship and the status of the marine environment. Parasites can infest the host directly by mass mortality or creating disease affecting the successful entity of both wild and cultivated marine organisms and leads to serious economic losses, especially in aquaculture. Indirect effects of parasite infestation are- making the host less resistant to environmental stresses, reduction of fecundity and immunity to diseases, stimulate the vulnerability to predation and impressibility to microbial infections and abate the quantity and quality of fish host [3]. There is a high tendency among people to consume fish due to its health benefits such as omega 3 fatty acids that are heart-friendly and can make improvements in brain development and reproduction [4]. Consumption of raw fish creates parasitic infection to human such as- *Anisakiasis* (nematode), *Clonorchis sinensis* (trematode) and *Diphyllobothrium* (cestode) [5] and this infection are a serious threat to the fish farming business of the world. Nematodes of Anisakidae family are parasites of many fishes and aquatic invertebrates which act as intermediate or paratenic hosts, while fish-eating birds and mammals are definitive hosts. Infective L3 larvae may be incidentally taken by a human through eating raw or undercooked fish meat, causing anisakiasis. Similar life cycles have been observed the most widespread genera, Anisakis, Pseudoterranova and Contracaecum. It is dangerous when ingested by humans, causing a condition known as Anisakiasis or helminthiasis in human [6]. Adult Contracaecum is parasites of piscivorous birds and mammals associated with fresh, brackish and marine environments which are found in the stomach or small intestine of birds. This nematode use aquatic invertebrates and fish species as a

second intermediate host [7], a wide spectrum of invertebrates and many fish species have been reported to carry larval *Contracaecum sp*. [8]. *Otolithoides pama* (Hamilton, 1822) is a benthopelagic fish which is found in the estuary and Bay of Bengal of Bangladesh and locally known as "Poa fish". This fish species is under the Sciaenidae family and its common name is Pama croaker. As the poa fish are abundant in the Chattogram region and it is consumed by local people in high amount so there is a chance of infection for human. If the parasite is found in the muscle part of the fish, it can capable of creating infection and ultimately develop the zoonotic disease by eating raw or improperly cooked in human. A little knowledge about the distribution, prevalence, parasitic intensity, pathogenic effects and control of most of the parasitic diseases in natural population of marine water fish has been obtained in Bangladesh. Though the *Otolithoides pama* is popular fish in the Bay of Bengal very little parasitic investigation has been done so far. Therefore, the present study investigated *Contracaecum sp*. larvae in *Otolithoides pama* from the monthly variations of prevalence and intensity are according to host weight and season.

MATERIALS AND METHODS

Study Area and Study Period

The present research study was carried out from the landing center, Fishery Bazar ($22^0$19'42.42'' N to 91^0 50'39.14'' E) Patharghata, Chattogram. The duration of the present study was from July 2017 to January 2018.

Sample Collection

A total of 160 fishes were collected from the mentioned landing center and immediately brought into the Disease and Microbiology laboratory of Chattogram Veterinary and Animal Sciences University. The Sampling was done four times in a month. The monthly sampling size was 20. All the fish samples and chemicals were purchased as per the permission by the ethical committee of the department.

Laboratory Study and Parasitological Observation

In the laboratory, all the fishes were taken into tray and numbering of the fishes was done. The length measurement of fishes was done using a graduated wooden measuring scale and the weight was done by using weighing balance (RADWAG, Model AS 220|C|2) (Figure-1). The fishes were examined only for endoparasites. Each fish was opened carefully and the body cavity and other internal organs were observed (Figure-2). The alimentary tract was isolated and kept in Petri dishes containing water (Figure-3). The parasites of different organs were collected and placed in 0.89% physiological saline for one hour. The parasites were fixed using 10% formaldehyde. The parasite was observed under Digital microscope (Optika, Model B 190) (Figure-4) and parasite group was identified using the identification key provided by L. Becky 2004. The permanent slide was prepared through the whole mount. The prevalence and Intensity were calculated according to established criteria [9]. The species of the parasite was identified according to established criteria [4].

Fig-1: Before starting the laboratory work and parasitological observation a) Length and b) Weight measurement were done for every individual fishes

Fig-2: Fishes were cut (c) through the abdomen from Anus to the Pelvic fins to observe (d) the intestine for parasite collection

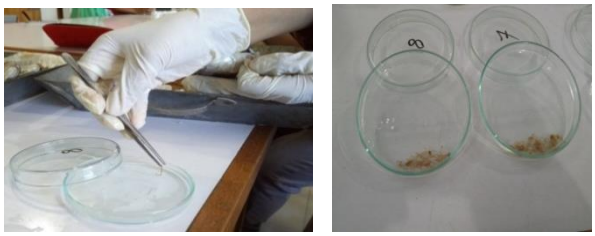

Fig-3: Parasites were collected from the intestine by forceps (e) and placed them on Petri dish (f) for microscopic observation

Fig-4: Collected parasites were observed under microscope (g) for identification (h) of the observed species

Data Entry and Statistical Analysis

The fishes of every sampling were divided into four groups and the size of the fishes was divided into six groups. The obtained data from every sampling was imported, stored and coded accordingly using Microsoft Excel-2007. These data were transferred to SPSS software for one way ANOVA analysis. The one way ANOVA analysis was done at a significance level of $P<0.05$.

RESULTS

119 out of 160 sciaenid fishes belonging to the species *Otolithoides pama* were found infected with the parasite. The average length and weight of fishes were 18.88±1.68cm and 92.98±23.16 g respectively. A total of 2,149 parasites were extracted from 119 fish.

Identification of Parasite

The identified parasite was nematode group and the genus was *Contracaecum*. The larvae of genus *Contracaecum* was non-segmented and white in color (Figure 5 (A, B, C)). Body surface was smooth, has one boring tooth interiorly, nerve ring, esophagus and long intestinal caecum (Figure 6 (A, B)). The nerve ring was located at the surrounding of the esophagus and the tail was conical and short.

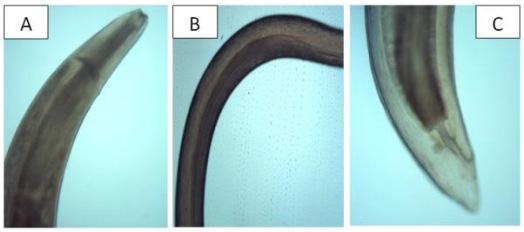

Fig-5: *Contracaecum* sp. larvae from *O. pama.* A. Anterior part, 4X, B. Middle part, 4X, C. Posterior part, 10X

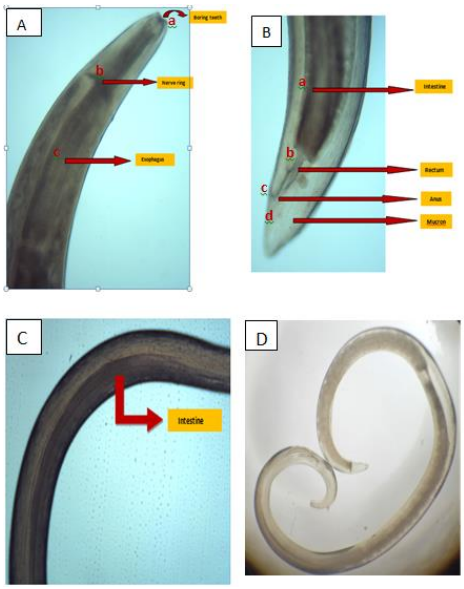

Fig-6: Labeling of different body parts of *Contracaecum sp.* A. a.Boring teeth, b. Nerve ring, c. Esophagus B. a.Intestine, b. Rectum, c. Anus, d. Mucron C. Intestine D. *Contracaecum sp.* larvae

Prevalence and Intensity of *Contracaecum* sp. in *O. pama*

The prevalence and intensity of parasites were varied in a significant number in different months. The highest prevalence (100%) was observed in June, September and October and the lowest (15%) in August (Table-1, Figure-7). The intensity was highest in October (43.9) and the lowest in August (3.67) (Table-1, Figure-8). The prevalence and intensity of infestation of *Contracaecum* sp. were significantly (P<0.05) different in different months.

Table-1: Monthly distribution of *Contracaecum* sp. in *O. pama*

Months	No. of fish examined	No. of fish Infected	Total no. of parasite	Prevalence (%)	SD for prevalence	Intensity	SD for intensity	Abundance
June	20	20	251	100	0.00	12.55	2.73	12.55
July	20	14	105	70	20.00	7.5	5.20	5.25
August	20	03	11	15	19.15	3.67	4.36	0.55
September	20	20	183	100	0.00	9.15	2.97	9.15
October	20	20	878	100	0.00	43.9	5.28	43.9
November	20	17	178	85	10.00	10.47	4.35	8.9
December	20	10	229	50	25.82	22.90	11.36	11.45
January	20	15	314	75	19.15	20.93	10.84	15.7

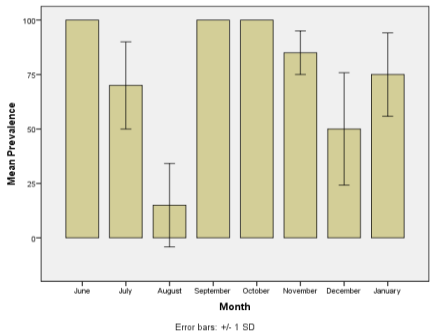

Fig-7: Prevalence of *Contracaecum sp.* in Different Mouth

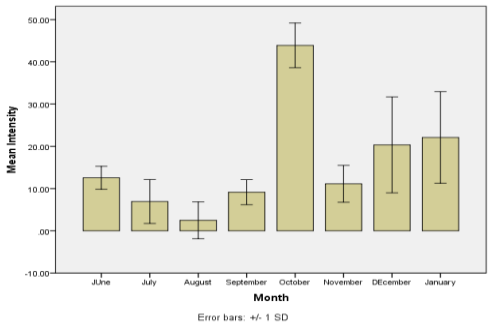

Fig-8: Intensity of *Contracaecum sp.* in Different Mouth

Seasonal Distribution of *Contracaecum* sp.

There was a remarkable variation of parasite among prevalence, intensity, and abundance in different seasons**.** Prevalence, intensity and abundance were highest during autumn and lowest in the rainy season (Table 2, Figure 9).

Table-2: Prevalence, Intensity, and Abundance of *Contracaecum* sp. in *O. pama* in different seasons

Seasons	No. of fish examined	No. of fish Infected	Total no. of parasite	Prevalence (%)	Intensity	Abundance
Rainy	60	37	367	61.67	9.91	6.11
Autumn	40	40	1061	100	26.53	26.52
Winter	60	42	721	70	17.16	12.01

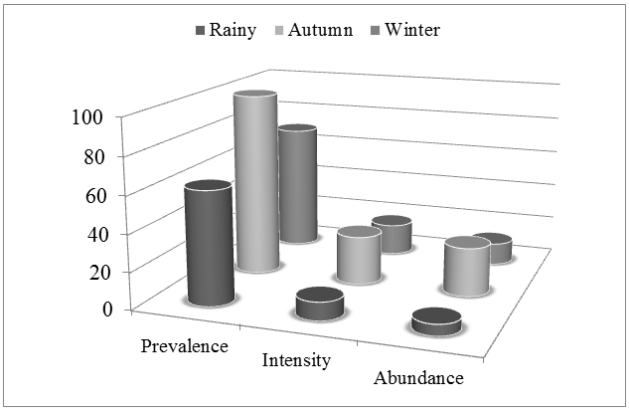

Fig-9: Seasonal Varition of *Contracaecum* sp. in *O. Pama*

The infestation of *Contracaecum* sp. in different size group

The prevalence, Intensity and Abundance varied with the size of the host. The highest prevalence, Intensity and Abundance were observed in larger weight fishes (151-170gm). The lowest prevalence was found in 91-110 weight groups of fishes (Table-3, Figure-10). In case of Intensity and Abundance, both were lower in 71-90(gm) weight groups of fishes (56).

Table-3: Infestation of *Contracaecum* sp. in different weight groups of host

Wt. classes(gm)	51-70	71-90	91-110	111-130	131-150	151-170
Sample size	27	56	46	18	9	4
No. of fish infected	25	40	28	13	9	4
Number of parasite	291	445	542	367	244	293
Prevalence	92.59	71.43	60.87	72.23	100	100
Intensity	11.64	11.12	19.35	28.23	27.11	73.25
Abundance	10.78	7.96	11.78	20.39	27.11	73.25

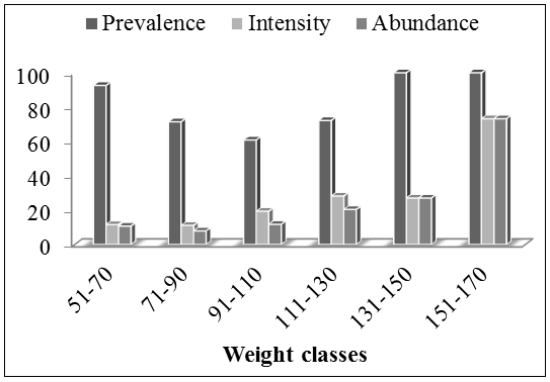

Fig-10: Variation of parasite Infestation in relation to fish size

Distribution of *Contracaecum* sp. in Different organs of host fish

Contracaecum sp. was distributed throughout the alimentary tract of the host. These nematodes were mainly found in the body cavity but some were extracted from the stomach, Intestine, liver and pancreas of fish. The mean count of the parasite was highest from the body cavity (70.45±24.45) in the larger weight fishes (Table-4, Figure-11).

Table-4: *Contracaecum sp*. infection in different organs of Pama Croaker fish

Wt. Classes (gm)	51-70	71-90	91-110	111-130	131-150	151-170
Body cavity	9.93±8.4^{c}	7.27±8.4^{c}	10.33±14.92^{c}	18.72±22.93^{bc}	25.44±22.80^{b}	70.45±24.45^{a}
Stomach	0.44±0.93^{b}	0.36±0.78^{b}	0.20±0.58^{b}	0.56±0.92^{b}	0.78±0.97^{b}	1.75±2.06^{a}
Intestine	0.26±0.52^{a}	0.14±0.52^{a}	0.24±0.52^{a}	0.56±1.1^{a}	0.44±0.73^{a}	0.00±0.00^{a}
Liver	0.04±0.19^{b}	0.07±0.26^{b}	0.04±0.19^{b}	0.33±0.97^{ab}	0.11±0.33^{b}	0.50±0.58^{a}
Pancreas	0.11±0.42^{a}	0.14±0.44^{a}	0.23±0.78^{a}	0.17±0.38^{a}	0.33±0.50^{a}	0.25±0.50^{a}
Total	10.78±9.18^{c}	7.98±8.94^{c}	11.02±15.46^{c}	20.39±23.76^{bc}	27.11±23.57^{b}	73.25±26.32^{a}

Data without the same superscript indicate there are significant differences between them (P<0.05)

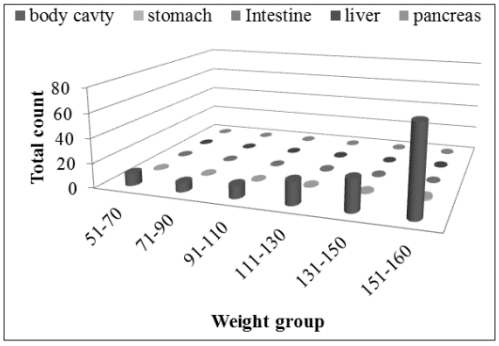

Fig-11: Distribution of *Contracaecum* sp. in Different organs variation of parasite Infestation in relation to fish size

DISCUSSION

The present study found that pama croaker (*O. pama*) fishes were highly infested with nematode parasite. In the present study nematode named *Contracaecum* sp. larvae were found. *Contracaecum aduncum* was reported [10] in sciaenids fishes from the southeast coast of India. The following parasites were listed down from *O. pama*: *Gymnorhynchus* sp., *Lytocestus* sp., *Goezia* sp., *Pallisentis* sp. in Chattogram region [11].

The larvae of genus *Contracaecum* have one boring tooth interiorly, nerve ring, esophagus and long intestinal caeca. The identical observation was also found that *Contracaecum* has one boring tooth interiorly, long esophagus and long intestinal caeca [4]. The *Contracaecum* larva was recorded from *Hoplias malabaricus* and *Hoplerythrinus unitaeniatus* [12]. In the present study, the larva of *Contracaecum* was whitish in color, long intestinal caecum, and nerve ring located at the surrounding of the esophagus, short and conical shaped tail. A similar observation was found the *Contracaecum* larva from *Hoplias malabaricus* [12]. Al-Zubaidy [13] described that since the *Contracaecum* sp. is not host specific at the larval stage, it was found in a wide range of different available fish host species, to date, 25 fish species have been reported parasitized by *Contracaecum* sp. larvae and this may result in a higher probability of transmission. Al-Zubaidy [14] stated that the *Contracaecum* sp. larvae appear to be naturally occurring, probably because of migratory birds (definitive host). Paperna [15] mentioned that the *Contracaecum* is linked with migration of piscivorous birds, particularly (or even only) Pelicans [15].

This study observed that the highest prevalence (100%) was in June, September and October and the lowest (15%) in August. The intensity was highest in October and lowest in August. The highest prevalence (100%) of *Contracaecum* sp. in *O. pama* was reported from this research in the autumn season with mean intensity 26.53. This could be due to migration of piscivorous birds in this season which was used as a definitive host of this parasite and nematode parasite use the fish and other aquatic invertebrates as an intermediate host. The prevalence of *Contracaecum* sp. was 100% with a mean intensity of 24.6 ± 38.3 in *Hoplias malabaricus* in Brazil [12]. Chandra [16] described that the prevalence and intensity depend on many factors like parasite species, host's feeding habits and the water body the fish inhabit [16]. In a study, it was proved that the infection in wild fish was higher than farmed fish due to the high abundance of definitive piscivorous birds in the wild regions [17].

The larvae and adult stages of *Contracaecum* sp. in fishes with different prevalence; for example 17.95% for *Contracaecum osculatum* in *Blicca bjoerkna*, 0.99% for *Contracaecum* sp. larva in *Iranocichla hormuzensis* [18]. However, the present study showed a relatively high rate of infection that could be associated with a low temperature in the sampling site and month. The environmental changes such as water and air temperature; salinity or dissolved oxygen can cause the body weakness of the fish and increase the risk of parasitism [19].

The present study observed that the larger weight fishes were highly infested than the smaller weight fishes. This might be due to larger weight fishes taking more food containing this parasite. This study also determined that parasite was mainly found in the body cavity, some parasites were found in the stomach, intestine, liver and pancreas. Rohde [20] stated that the coelomic cavity may lead to complete castration and reductions in egg numbers have been found due to this parasite.

As the pama croaker fish is very popular in the Chattogram region so there is a chance of infection by this parasite. The chance of infection might be reduced by proper gutting and cooking of fish before eats. The Larval stage of *Contracaecum* sp. is responsible for causing a parasitic syndrome in humans [21]. Such

larvae which are normally found in the intestinal mesentery or adhered to viscera may travel to muscles after the host's death. Their preference for parasitizing visceral organs limits their zoonotic potential, but if fish is not frozen or filleted after capture, nematodes may migrate into the flesh. Thus, considering the potential public health importance of larval *Contracaecum* sp. special care should be given in the consumption of fish from that area. The *Contracaecum* sp. in final hosts and human can cause clinical manifestations including haemorrhages, elevated eosinophil count, ulcerations of the gastrointestinal tract, bloody stools, granulomatous nodules and intestine blocking and even it can be life-threatening and leads to death in heavy infections [22]. According to Human anisakidosis (previously known as anisakiasis) is a disease that became of major health and economic importance [23]. Humans were considered accidental hosts in the life cycle, as a result of consumption of raw fish, and these nematodes never develop inside the alimentary canal of human and may penetrate the tract and associated organs with severe pathological consequences.

CONCLUSION

The present study was conducted to determine the prevalence and intensity of parasites in *O. pama*. This study determined that Jew-fish is highly prevalent in parasite infestation. *Contracaecum* sp. of the nematode group was found to be prevalent in pama croaker fish in Chattogram, Bangladesh. Highest prevalence was observed in June, September, and October and the lowest in August. The intensity was highest in October and lowest in August. Prevalence, intensity, and abundance were highest during autumn and lowest in the rainy season. The prevalence, intensity, and abundance were highest in larger weight fishes than smaller fishes. This study also noticed that the *Contracaecum* sp. was mainly found in the body cavity. 100 percent prevalence of this nematode parasite in poa fish indicates that benthopelagic fishes of Bay of Bengal to be at higher risk of infestation by this nematode parasite most likely due to pollution, migration of piscivorous birds and feeding habit of the fish. The allied risk factors for the occurrence of the nematode parasite in poa fish are overlooked as this fish are eaten after removal of visceral parts and proper cooking by the people of Bangladesh. This research will address the problem of the parasite in Jew-fish in the Chattogram region so that special care should be given in the consumption of the fish.

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