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Research Article

Assessment of Intestinal Parasites in Pseudotolithus elongatus in Brass Island

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Abstract: Due to the potential impact of fish parasites on public health and fish performance, as well as the importance of the fish industry and consumption, it is important to identify the group of parasitic helminths present in the commonly consumed *Pseudotolithus elongatus* as a track of environmental health as well as public health threats. The study was aimed at identifying intestinal parasites present in *Pseudotolithus elongatus* and determining the association between the infection rate and length of the fish. The observational study was conducted in the onshore area of Brass Island, Bayelsa State. A total of 50 *Pseudotolithus elongatus* were obtained by hired fisher men and the fish were identified and physically assessed for length, weight and diameter. The fish were killed and intestines harvested for parasitic assessment microscopically. The results revealed that there *Capillaria species, Acanthocephala species,* and *Diplostomum commutatum* were identified in the sample. Also, there was no significant (p-value>0.05) association between length and prevalence of the infection. This study has therefore revealed that though intestinal parasites were found in the fishes, the prevalence of the infection was not dependent of the length of the fishes.

Keywords: intestinal parasites, helminth, fish, river.

Introduction

Fish serve as a significant source of protein for humans and contribute to the global food supply [1]. However, the interactions between fish hosts and parasites have garnered substantial interest in recent years; fish are hosts to numerous adult helminth parasites and also to their larval forms [2]. The regular ingestion of larval helminth parasites by fish is due to the abundance and diversity of these parasites in aquatic ecosystems, leading to either synergistic or antagonistic relationships between the parasites and host fish [3-5]. However, in cases of high impacts, infestation can be characterized as a disease capable of causing health impacts on both the fish and humans in general [6,7]. The presence of parasites in aquatic fauna indicates the degradation of aquatic ecosystems by pollutants (plastic waste, fecal waste, fishery waste, water treatment waste etc) [8]. Nonetheless, parasites play a key role in ecosystem functioning as an integral component of food webs and can be used in the assessment of environmental quality and richness [9].

Helminths, multicellular parasitic worms, are a major group of fish parasites causing severe loss in fish production [10]. Helminth parasites include trematodes, cestodes, nematodes, and acanthocephalans, which attach to the host through suckers and hooks and enter the host through various means, including skin, mouth along with food, and gills etc., causing infections in fish that tend to be detrimental to the entire production chain [11,12]. However, the diversity of helminths that infect farmed fish is lower compared to wild fish due to restrictions in contact between host and parasites [13,14]. Fish helminthology has received less attention; this is likely because helminths primarily infect the internal organs, predominantly the gastrointestinal tract, which does not make up the edible portion of the fish [15].

Potentially all freshwater and brackish water fish may be affected, with heavier infections in predatory fish [16]. Isolated records of parasitic species infecting commercially important marine fish in sub-Saharan Africa have been reported [17]. This includes Pseudotolithus elongatus; one of the most economically significant and dominant estuarine species in the tropical and subtropical regions of the world. Pseudotolithus elongatus is a member of the Sciaenidae family, commonly known as croakers, constituting a plentiful and commercially valuable fish in Nigeria and gradually increasing imports in Asia [18]. Adult helminths commonly occur in the digestive tract of Pseudotolithus elongatus. Invasion of the alimentary canal of fish by most adult helminths can cause disruption of gut tissues and gut function [19,20].

Consequently, understanding the diversity of parasites in *Pseudotolithus elong*atus is essential for ecological and evolutionary studies as parasitism plays a significant role in ecosystems by regulating the abundance or density of host populations, establishing food chains, and structuring animal communities [21].

Globally, helminth infections have a major impact on the fish industry due to the pathogenic effects of several species affecting economic productivity, as well as because of the zoonotic potential of many species. Humans acquire fish-borne helminth zoonoses via the consumption of raw or under-cooked fish containing infective parasite larvae [22]. Due to the potential impact of fish parasites on public health and fish performance, as well as the importance of the fish industry and consumption, it is important to identify the group of parasitic helminths present in the commonly consumed *Pseudotolithus elongatus* as a track of environmental health as well as public health threats. [22-24].

Materials and Methods

Study Site/Area

The field study was conducted in the onshore area of Brass Island, located approximately at latitude 4°16’ to 4°18’ North and longitude 6°13’ to 6°16’ East in the Brass local Government Area, Bayelsa state, Nigeria, located in the Niger Delta Basin, a traditional fishing village of the Nembe people [25,26]. It is characterized by a rather constant ambient temperature of 27-34ºC. Laboratory studies / analysis was conducted

in Department of Biology Laboratory of Federal University Otuoke, in Otuoke town in Ogbia Local Government Area, Bayelsa State Nigeria, located in approximately at longitude 4°49F North and latitude 6°20 East [25,26].

Fish Sample Collection

Fish samples were caught by hired fishers at onshore area of Brass Island. The fishers used a wide range of fishing gears such as gill nets, cast nets of different mesh sizes and traps. The fish samples were collected alive in clean containers with water from collection site and transported to the laboratory.

Examination of fish sample collected

The collected specimen was identified and classified according to most recent nomenclature as described by [27].

Physical Parameter of fish sample

Morphometric data of each collected fish was measured and recorded according to [28].

Length Measurement

Length of the fish was obtained using a meter ruler. Length in centimeter was taken and recorded.

Weight Measurement

Fish was placed on a digital weigh balance. Weight was recorded in grams or kilograms.

Dissection and Examination of Fish for parasite infestation

Following external examination, a longitudinal incision in the ventral surface was made on the fish using a sharp blade and all inner organs were removed and separated. The alimentary canal was carefully removed and cut into sections corresponding to the oesophagus, stomach and intestine. Each section was placed in different petri-dishes containing normal saline. An incision was made along the length of the untangled intestine which was pulled open carefully using two sharp tweezers. The exposed surface and content were examined for helminth parasites.

Collection of Parasites

The intestinal wall was examined for parasites using a binocular microscope and magnifier lens. Each helminth was gently and slowly removed from the intestinal wall with a pair of tweezers, ensuring it remained intact. In instances where the anterior end was deeply embedded in the intestinal mucosa, a few drops of methanol were added to the normal saline containing the parasites adhered to the intestinal wall. This process immobilized the parasites, loosened their grip on the intestinal wall, and facilitated the detachment of the proboscis without distorting the arrangement of hooks. Swabs from the intestinal lining were also smeared on glass slides and covered with cover slips for examination.

A squash of the small intestine and large intestine was prepared by placing a portion of the small and large intestine mixed with normal saline in a centrifuge, which served as a wet mount for examination under a compound microscope. The rinse from the section of the intestinal tract was mixed with normal saline, Sodium chloride (NaCl), and washed into a 106 μm mesh sieve. The contents of the sieve were examined under a microscope for the presence of parasite ova, cysts, or adult forms.

1. Whole mounts of specimens were stained using Lugol's iodine.

2. All observed helminths in each fish were isolated and appropriately preserved in 70% alcohol.

3. The collected specimens were studied morphologically, and important characteristics were observed.

4. The parasite species were identified based on the morphological characteristics of adults and eggs.

Statistical Analysis

The proportion of positive outcomes was expressed as a percentage, calculated as the ratio of infected to total examined, and multiplied by 100 to express the ratio in percentage. A Chi-square test was performed to determine the association between length and prevalence of the infection. The test was considered significant at a p-value less than 0.05.

Results

The weight, diameter, and length of the sample ranged from 100 – 140g and above, 10 – 50mm, and 21 – 25 and above, respectively. A larger number (15) of the fish samples examined weighed between 100 – 110g, and (7) fish samples examined weighed between 110 – 120g and 130 – 140g, respectively. A larger number (13) of fish samples measured between 25cm and above in length.

Table 1. Summary of general physical parameters of the fish samples examined.

Length (cm)	Abundance	Weight (g)	Abundance	Diameter (mm)	Abundance
21 — 22	12	100 —110	15	10 -20	16
22 — 23	8	110 —120	7	20 – 30	6
23 — 24	10	120 —130	10	30 – 40	8
24 — 25	7	130 —140	7	40 – 50	5
25 - above	13	140– above	11	50 - above	15
TOTAL:	50		50		50

The prevalence of the percentage (%) was recorded in the study. 5(62.5%) out of 8 fishes within the length of 22 – 23cm showed positive to intestinal helminthic parasites in *Pseudotolithus elongatus.* The length with the least number of infected fish 2(15.4%) 25cm and above. The intestinal helminthic parasites identified in the study included *Capillaria* sp, *Acanthocephala* sp and *Diplostomum commutatum.* All the fishes within the length range of 25cm and above examined tested positive to all three (3) parasites species which showed a mixed infection. The association between prevalence of infection and the length of the fishes was not significant (p-value=0.172).

Table 2. Prevalence of Parasites based on length

Length	No. examined	No. infected (%)	χ^2	p
21 – 22cm	12	4 (33.3)		
22 – 23cm	8	5 (62.5)		
23 – 24cm	10	3 (30)		
24 – 25cm	7	4 (57.1)		
25 – above	13	2 (15.4)		
Total	50	18(36)	6.388	0.172

Parasite identified in the fishes	Prevalence (%)	Length identified
Capillaria species	33	20-21
Acanthocephala species	62.5	21-22
Diplostomum commutatum	30	22-23
Metacercaria of all parasites	57.1	24-25

Discussion

The result of this study showed that 50 fish sample examined, about 36% of *Pseudotolithus elongatus* were reported to be infected. Fish length between 20–21cm had 33.3% prevalence of *Capillaria sp*, while those of 21-22cm, 22-23cm, and 24–25cm long were prevalent by (62.5% of *Acanthocephala sp*), (30% *Diplostomum commutatum*) and (57.1% metacercaria of all the parasites), respectively.

Utterly, the occurrence of *Capillaria sp* is in synchrony with similar study carried out by [21][29] who reported 30% prevalence of same parasite in *Pseudotolithus elongatus*, confirming 33.3% prevalence of same parasite (of 21–22cm in length) in our findings. Although, the difference in prevalence could be attributed to factors such as study area, time of study and dynamics of fishery which are all time-dependent, hence, they are liable to change with time. The discovery of *Acanthocephala sp* in *Pseudotolithus elongatus* affirms the propensity of being a definitive host with 62.5% calling for attention on the spiny-headed worm known to cause perforation in the gut wall and fatal

peritonitis. While the synergistic occurrence of all aforementioned worms delineates the level of tolerance in the same host: *Pseudotolithus elongatus* which seems to provide a conducive definitive environment for their co-existence.

Also, similar studies by [21][29] are in agreement with our findings where the synergistic occurrence of *Capillaria sp, Acanthocephala sp* and *Diplostomum commutatum* was found in *Pseudotolithus elongatus*. Here, in our study, for Diplostomum commutatum, the existence of only the metacercaria of the fluke as isolates of Pseudotolithus elongatus makes it deducible that it most probably uses Pseudotolithus elongatus as intermediate host, though it could not be ascertained if the metacercaria (of Diplostomum commutatum) were in developmental stage or not. Hence, the total absence of the mature parasites makes our inference more viable.

Further studies by [29] attest that fish species of 21cm - 30cm length (equivalent: 210mm - 300mm) are usually isolable of parasites (as seen in our study) because this length range has been described as spawning age group. The reason is self-explanatory — spawning begins with migration to more suitable reproductive sites where fish species are exposed to water bodies of various chemical, biological and physical parameters, all of which aid the survival and reproduction of parasites. Hence, the greatest parasite burden among all the various length groups recorded in our study. Also, the absence of parasites in length group below recorded range suggests the inability of the internal environment of the fish providing a thriving habitat for parasitic growth and existence, governed by the fact that the longer the fish, the older the fish. It follows that older fish rarely come to water surface — a breeding ground or meeting point between fish species and mature parasites which thrive and sort for host here. The reason larger fish tend to have lesser parasite burden!

Conclusion

The intestinal helminthic parasites such as *Capillaria sp, Acanthocephala sp* and *Diplostomum commutatum* were isolated in *Pseudotolithus elongatus* (Croaker fish), although, the prevalence of isolated parasites seems impersonally insignificant, this however, would not serve a reason to neglect the need for periodic scrutiny or examination since epidemic usually arises from sporadic conditions, connecting the disease-triangle.

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