



ECTOPARASITES OF *CHRYSICHTHYS NIGRODIGITATUS* FROM ESCRAVOS ESTUARY, DELTA STATE, NIGERIA, AND ITS ZOONOTIC IMPLICATION ON FISH CONSUMER

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ABSTRACT

This study was conducted to evaluate the ectoparasites of *C. nigrodigitatus* from the Escravos Estuary, highlighting the public health implications on fish consumers within the area. A total of 180 *Chrysichthys nigrodigitatus* specimens were purchased from artisanal fishers in Okerenkoko community. The fish specimens were examined for ectoparasites at the Fisheries and Aquaculture Laboratory, Nigeria Maritime University, Okerenkoko. Results showed a low overall prevalence of 8.33 %. The highest prevalence (2.78 %) was recorded in monogenea (*Gyrodactylus* sp.) and least (2.22 %) in protozoan cyst. Abundance and intensity were highest (0.10 and 4.50) in protozoan cyst and least in *Dactylogyrus* sp. (0.04 and 1.33). Findings revealed that prevalence, abundance, and intensity of ectoparasites in *C. nigrodigitatus* were higher (9.17 %, 0.23 and 2.55) in rainy season than dry season. Size class of 40.00 – 49.90 cm recorded the highest prevalence, abundance, and intensity (12.50 %, 1.44 and 11.50) of ectoparasites. Female *C. nigrodigitatus* had a higher prevalence, abundance, and intensity of ectoparasites (8.87 %, 0.23 and 2.55) compared to the males. In relation to organ, prevalence and abundance of parasites were highest (4.44 % and 0.12) in the skin whereas intensity was highest (2.80) in the gills. In conclusion, the prevalence of ectoparasites in *C. nigrodigitatus* from the Escravos Estuary is low indicating the healthy state of the estuary and the low risk of zoonosis among inhabitants of the estuary who consume *C. nigrodigitatus*. Therefore, to completely eliminate the risk of zoonosis, hygienically prepared and properly cooked *C. nigrodigitatus* should be consumed.

Keywords:

Ectoparasites; *Chrysichthys nigrodigitatus*; Zoonosis; Escravos Estuary; Prevalence; Intensity

INTRODUCTION

The livelihood of many people depends on fish, especially in regions of the world designated as 'developing countries'. In Nigeria, fish is a significant source of animal protein, accounting for over 40% of the total protein intake (Ogunji and Wuertz, 2023). This high consumption is due to the availability and affordability of fish, making it a staple in many Nigerian diets. Fish and fishery products are not only the main resource for protein and micronutrients but are also of enormous economic importance, especially for the leading fish-exporting countries, with a total estimated value of US\$ 217.5 billion

(FAO, 2012). With the importance of fishery products for the daily human diet increasing, research into harmful organisms in fish products has also become more important. Fish can serve as possible hosts for a variety of parasites, making parasites a common occurrence in both commercial and recreational fishing (Michael et al., 2024). Fish-attacking parasites are typically linked to unfavorable environmental conditions including salinity and temperature fluctuations (Yusni et al., 2022). In Nigeria, parasitic diseases of fish pose a serious economic and public health concern in the fishing industry due to the risk of transmission of parasite from fish to fish consumers (Eyo and Effanga, 2018; Khalid et al., 2021; Asuquo and Eyo, 2023). In addition to zoonosis, parasite infection in fish can have a detrimental effect on fish species' acceptance value and flesh quality (Michael et al., 2024). Fish infections have directly endangered the health and growth of the fishes and have indirectly endangered human physiology and morphology (Khalid et al., 2021). Ectoparasites are parasites that are found on the external body part of the fish. According to Ekanem et al., (2014), ectoparasitic diseases affects the normal health and physiological conditions of fish leading to poor growth, abnormal metabolic activities and subsequently, death of affected fish. Because of its superior nutritional value, fish is essential to human nutrition. For humans and other livestock, fish is a great source of protein (Onoja-Abutu et al., 2021; Asuquo & Eyo, 2023). In addition to protein, fish are a good source of minerals, fats, and vitamins that help maintain food and nutrition security. *Chrysichthys nigrodigitatus* which is commonly known as the silver catfish is an important food fish that is popularly consumed by the inhabitants of the Escravos Estuary. *C. nigrodigitatus* is consumed because of its firm flesh, nice taste and flavor, appreciable size, and nutritional profile. There was no information on the parasites of *C. nigrodigitatus* in the Escravos Estuary until recently where Michael et al., (2024) conducted a survey on the endoparasites of this species in the Escravos Estuary. However, information provided by Michael et al., (2024) is still lacking some crucial information on the ectoparasites of *C. nigrodigitatus* in the Escravos Estuary which is an indicator that inhabitants of the Escravos Estuary are still exposed to the risk of zoonosis. Therefore, this study was conducted to evaluate the ectoparasites of *C. nigrodigitatus* from the Escravos Estuary, highlighting the public health implications on fish consumers within the area.

MATERIALS AND METHODS

Study Area description

This study was carried out in Okerenkoko which is a fishing community along the Escravos Estuary (Fig. 1), located in Warri South-West Local Government Area of Delta State. The Escravos Estuary is located geographically at latitude 5.6° N and longitude 5.3° E.



Fig. 1: Map of the study area showing sample collection points (Michael et al., 2024)

Collection transportation and identification of fish specimens

One hundred and eighty (180) fresh specimens of *C. nigrodigitatus* were purchased from landings of fishermen in Okerenkoko community. *C. nigrodigitatus* was caught using a gill net and handled carefully by the fishermen to minimize stress and prevent secondary infections. The fish were then immediately transported in containers filled with water from their natural habitat to the Fisheries and Aquaculture Laboratory at Nigeria Maritime University, Okerenkoko Campus. The fish species was identified using the guide by Idodo-Umeh (2003).

Measurement of biometric parameters

For each *C. nigrodigitatus* specimen, the biometric parameters including body weight in grams and total length in centimeter were measured according to the methods in Asuquo and Eyo (2023). The total weight was measured using a OHAUS SPX622 electronic scale while the total length was measured from the tip of the snout to the tip of the caudal fin to the nearest 0.1 cm using a measuring board. The fishes were grouped into three length classes including 20.00 – 29.90 cm, 30.00 – 39.90 cm, and 40.00 – 49.90 cm.

Sex differentiation

The sexes of *C. nigrodigitatus* were differentiated by dissecting the fish to examine the type of gonads (ovaries for female and testes for male) following the procedure in Osimen and Anagha (2020).

Examination of fish and identification of ectoparasites

For each fish specimen, gill, fin, eye, and skin biopsy were prepared and examined for ectoparasites. To prepare the gill biopsy, scrapping from second gill arch was collected according to Roohi et al., (2014). For fin biopsy, scrapping from the caudal and dorsal fin was obtained while scrapping from the eyes and the entire length of the lateral body wall was obtained for eye and skin biopsy. Wet mounts of all the prepared biopsied tissues were examined under MEDICA OLYMPUS binocular microscope for ectoparasites. Stereo dissecting microscope (MSC-ST45) was used to examine the gill for protozoan cyst. The ectoparasite were identified using parasites identification guide by Parpena (1996).

Parasitological indices assessment (PIA)

Formulas given by Upadhyay et al., (2012) were used in calculating the parasitological indices as follows:

$$\text{Prevalence} = \frac{\text{No of fish infected}}{\text{Total number of fish examined}} \times \frac{100}{1}$$

$$\text{Intensity} = \frac{\text{number of collected parasites}}{\text{number of infected fish}}$$

$$\text{Abundance} = \frac{\text{Total number of parasite recovered}}{\text{Total number of fish examined}}$$

Statistical Analysis

Statistical analysis done using Predictive Analytical Software (PASW) version 20.0. Student T-test and Analysis of Variance (ANOVA) was used in data analysis at 0.05 probability level.

RESULTS AND DISCUSSION

Prevalence, abundance, and intensity of ectoparasites in *C. nigrodigitatus* from the Escravos Estuary Results obtained for prevalence, abundance, and intensity of ectoparasites in *C. nigrodigitatus* from the Escravos Estuary is presented in Table 1. Prevalence was highest (2.78 %) in monogenea (*Gyrodactylus* sp.) and least (2.22 %) in protozoan cyst, abundance and intensity were highest (0.10 and 4.50) in

protozoan cyst and least in *Dactylogyrus* sp. (0.04 and 1.33). However, the overall prevalence of ectoparasites was low (8.33 %) and according to Michael et al., (2024) the Escravos Estuary is in good hygienic conditions. Also, the tidal rhythm of estuaries lowers the concentration of contaminants, keeping the estuary clean (Nzeako et al., 2014).

Prevalence, abundance, and intensity of ectoparasites in relation to season

Findings revealed that prevalence, abundance, and intensity of ectoparasites in *C. nigrodigitatus* were higher (9.17 %, 0.23 and 2.55) in rainy season than dry season.

Table 1: Prevalence, abundance, and intensity of ectoparasites in *C. nigrodigitatus* from the Escravos Estuary

Parasites	Host examined (%)	Host infested (%)	No. of parasites collected	Prevalence (%)	Abundance	Intensity
Monogenea (<i>Gyrodactylus</i> sp.)	180	5 (33.33)	12	2.78	0.07	2.40
Monogenea (<i>Dactylogyrus</i> sp.)	180	6 (40.00)	8	3.33	0.04	1.33
Protozoan Cyst	180	4 (26.67)	18	2.22	0.10	4.50
Total		15 (100.00)	38	8.33	0.21	2.53

Table 2: Prevalence, abundance, and intensity of ectoparasites in relation to season

Season	Host examined (%)	Host infested (%)	No. of parasites collected	Prevalence (%)	Abundance	Intensity
Rainy	120 (66.67)	11 (73.33)	28	9.17	0.23	2.55
Dry	60 (33.33)	4 (26.67)	10	6.67	0.17	2.50
Total	180 (100.00)	15 (100.00)	38	8.33	0.21	2.53

Prevalence, abundance, and intensity of ectoparasites in relation to size class

Findings showed that prevalence, abundance, and intensity of ectoparasites increased with increase in size class (Table 3). Size class of 40.00 – 49.90 cm recorded the highest prevalence, abundance, and intensity (12.50 %, 1.44 and 11.50) of ectoparasites in *C. nigrodigitatus* from the Escravos Estuary. These findings are consistent with that of other authors that prevalence, abundance, and intensity of parasites is higher in bigger fishes than smaller ones in Nigerian water bodies (Ekanem et al., 2014; Akinsanya et al., 2019; Effanga and Eyo, 2018). These findings may be attributed to the fact that older and larger fishes have longer exposure period in the aquatic environment than younger fishes, and also that larger fishes have increased surface area for parasites to thrive (Effanga and Eyo, 2018).

Table 3: Prevalence, abundance, and intensity of ectoparasites in relation to size class

Size class (cm)	Host examined (%)	Host infested (%)	No. of parasites collected	Prevalence (%)	Abundance	Intensity
20.00 – 29.90	60 (33.33)	4 (26.67)	4	6.67	0.07	1.00
30.00 – 39.90	104 (57.77)	9 (60.00)	11	8.65	0.11	1.22
40.00 – 49.90	16 (20.00)	2 (13.33)	23	12.50	1.44	11.50
Total	180 (100.00)	15 (100)	38	8.33	0.21	2.53

Prevalence, abundance, and intensity of ectoparasites in relation to sex

Female *C. nigrodigitatus* had a higher prevalence, abundance, and intensity of ectoparasites (8.87 %, 0.23 and 2.55) compared to the males (Table 4). These findings may be due to resistance to infections is sex-related (Emere, 2000). Also, the physiological states of female fish is another factor as females especially gravid ones are more susceptible to infection (Effanga & Eyo, 2018). These findings are in agreement with that of Effanga and Eyo (2018), and Akinsanya et al., (2019) and in disagreement with Ekanem et al., (2011), and Akinsanya et al., (2014).

Table 4: Prevalence, abundance, and intensity of ectoparasites in relation to sex

Sex	Host examined (%)	Host infested (%)	No. of parasites collected	Prevalence (%)	Abundance	Intensity
Male	56 (31.11)	4 (26.67)	10	7.14	0.18	2.50
Female	124 (68.89)	11 (73.33)	28	8.87	0.23	2.55
Total	180 (100.00)	15 (100)	38	8.33	0.21	2.53

Prevalence, abundance, and intensity of ectoparasites in relation to organs

In relation to organ, prevalence and abundance of parasites were highest (4.44 % and 0.12) in the skin whereas intensity was highest (2.80) in the gills. Organ specificity was observed in this study as *Dactylogyrus* sp. and protozoan cyst were only found in the gills whereas *Gyrodactylus* sp. was found in the skin and fins. This findings agrees with that of Eyo et al., (2015) and Asuquo and Eyo (2023). No parasite was recovered from the eyes indicating that the eyes of *C. nigrodigitatus* may not be a preferred organ for ectoparasites.

Table 5: Prevalence, abundance, and intensity of ectoparasites in relation to organs

Fish organ	Host examined (%)	Host infested (%)	No. of parasites collected	Type of parasites	Prevalence (%)	Abundance	Intensity
Gills	180 (100.00)	5 (33.33)	14	<i>Dactylogyrus</i> sp. and Protozoan cyst	2.78	0.08	2.80
Fins	180 (100.00)	2 (13.33)	3	<i>Gyrodactylus</i> sp.	1.11	0.02	1.50
Eyes	180 (100.00)	0 (0.00)	0	Nil	0.00	0.00	0.00
Skin	180 (100.00)	8 (53.34)	21	<i>Gyrodactylus</i> sp.	4.44	0.12	2.63

Conclusion and Recommendation

In conclusion, the prevalence of ectoparasites in *C. nigrodigitatus* from the Escravos Estuary is low indicating the healthy state of the estuary and the low risk of zoonosis among inhabitants of the estuary who consume *C. nigrodigitatus*. Therefore, to completely eliminate the risk of zoonosis, hygienically prepared and properly cooked *C. nigrodigitatus* should be consumed.

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