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Condition Factor, Length-Weight Relationship and Gastro-Intestinal Parasites of Tilapia (*Sarotherodon melanotheron*) And Mullet (*Neochelon falcipinnis*), Creek Road Market, Port Harcourt, Rivers State, Nigeria.

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Abstract: Research into the condition factor (CF), length-weight relationship (LWR) and parasites of fish are important for fisheries management. This study examined Tilapia (*Sarotherodon melanotheron*) and mullets (*Neochelon falcipinnis*) obtained from Creek Road Market, Port Harcourt-Nigeria, for their CF, LWR and parasites. One hundred samples of each species were examined from February-March, 2021, in the Entomology and Parasitology Laboratory, Department of Animal and Environmental Biology, Rivers State University, Nigeria. Fish species were identified using standard keys; total length and wet body weight of each specimen were measured and documented. Fulton's CF and LWR were computed using standard formulae. They were examined for ecto-parasites and dissected for gastro-intestinal helminth parasites. Parasites were identified using taxonomic keys. Mean wet body weight was 40.40±10.30g and 34.98±13.32g for *S. melanotheron* and *N. falcipinnis*, respectively. Mean total length was 12.54±1.08cm and 15.28±2.11cm for *S. melanotheron* and *N. falcipinnis*, respectively. Fulton's CF ranged from 1.50 - 2.66 in *S. melanotheron* and 0.56-1.84 in *N. falcipinnis*. The length-weight relationship for *S. melanotheron* was Y = -1.298 + 2.635X with a b-value of 2.635, and Y = -1.748 + 2.760X with a b-value of 2.760 for *N. falcipinnis*. Three parasite species were isolated: the parasitic isopod (*Cymothoa exigua*) and Acanthocephalans (*Acanthocephalus* sp.) from *S. melanotheron*, and marine leech (*Zeylanicobdella arugamensis)* from *N. falcipinnis*. Prevalence of infection was 1.0%, 5.0 % and 1.0%, respectively, for *C. exigua*, *Acanthocephalus* sp. and *Z. arugamensis*. Condition factor was better in *S. melanotheron*; both species exhibited negative allometric growth, and parasite diversity was low.

Keywords: **Allometric growth, *Zeylanicobdella arugamensis*, *Cymothoa*, Parasitic isopod, *Acanthocephalus*.**

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INTRODUCTION

The study of condition factor and length-weight relationship is of prime importance in fisheries (Oliveira *et al*., 2020). Fish length and weight are useful in stock assessment, ecology studies, and to determine and compare the health of fish populations. Regular assessment of these factors are required in

the management of fisheries and in aquaculture (Getso *et al*., 2017; Jisr *et al*., 2018). The length-weight relationship can be used to compute fish condition factor which reflects the impacts of both biotic and abiotic factors on the fish, and is based on the hypothesis that heavier fish of a fixed length is in better condition than lighter fish of same length (Ujjania *et al*., 2012; Getso *et al*., 2017; Moslen and Miebaka, 2017). Parasite burden may also impact on the condition factor a fish species.

Research into the parasites of fish in Rivers State, Nigeria, have reported the presence of acanthocephalans in Tilapia (Amuzie and Okwodu, 2019), parasitic isopods in *Pomadasys* and other species (Ugbomeh and Nwosu, 2016; Okere *et al*., 2019; Ikiriko *et al*., 2020), *Zeylanicobdella arugamensis* from *Liza* (now *Neochelon*) *falcipinnis* (Ikiriko *et al*., 2020), *Lethacotyle* sp. and Anisakid larvae in *Caranx hippos* and Anisakid larvae in *Sardinella maderensis* (Odum and Amuzie, 2021) and *Paradilepis* sp. in *Tilapia guineensis* (Joseph *et al*., 2020). These authors reported low incidence of parasites in fish species examined. However, Ogbeibu *et*

al. (2014) in an earlier research, isolated a total of sixty-four nematode parasite species including *Capillaria zederi, Aplectana hamatospicula, Heliconema* sp., *Neocucullanus* sp. etc, though he examined a large number of host species.

In this study, we investigated the condition factor, length-weight relationship and gastro-intestinal helmint parasites of Tilapia (*Sarotherodon melanotheron*) and mullets (*Neochelon falcipinnis* [Valenciennes, 1836], formerly *Liza falcipinnis*, Froese and Pauly, 2021a) obtained from Creek Road Market, Port Harcourt, Nigeria.

Materials and Methods

Research Area and Collection of Samples

` Creek road market (4º45'04.43'', 7º00'14.08'') is located by a landing port downstream of the Bonny River system (Onojake *et al*., 2017) in the city of Port Harcourt, Rivers State, Nigeria. Fish specimens were bought in the early hours of the morning from fish traders who purchased them directly from fishers. Sampling lasted from February to March, 2021. In all, two hundred specimens were examined, comprised of 100 Tilapia and 100 mullets. These were transported in ice-chests to the Entomology and Parasitology Laboratory, Department of Animal and Environmental Biology, Rivers State University, Port Harcourt, Nigeria, for identification, morphometric measurements and dissection.

Fish Identification and Morphometric Measurements

Fish were identified according to the keys provided by (Schneider, 1990). The wet body weight of specimens was taken using an electronic weighing balance (Denver instrument, model TP-512A) to the nearest gram. Total length was measured in cm using a meter rule.

Calculation of Condition Factor and Length-Weight Relationship

Fulton's condition factor (CF) was computed according to Zhelev *et al.* (2015) as follows:

$CF = BW / TL^3 \times 10^2$, where BW is the wet body weight of fish in g and TL is total length of fish in cm. It was computed using Microsoft Excel.

The regression equation used to represent the length-weight relationship in this study is

$$Y = a + bX$$

Where Y represents Weight, a and b represent constants of the equation; b is also significant for the length-weight relationship, and X represents total length.

With that equation, the weight can be computed for known total lengths. The length and weight were log transformed and the linear regression analysis tool of the statistical software Minitab 16 was used to compute the length-weight relationship.

Parasitic Examination of Fish Specimens

Each fish sample was examined thoroughly for ecto-parasites. The gills were also excised into universal bottles containing 0.9% normal saline solution, shaken vigorously to dislodge parasites, and poured into Petri dishes for examination. The fluid content was examined under the microscope at x10 and x40 objective.

The fish were subsequently dissected and the gastrointestinal tract excised and examined for helminth parasites. The tract was sectioned into Petri dishes holding 0.9% normal saline for parasitological examination. The Parasites encountered were removed using pipettes and fixed in universal bottles containing 70% ethanol.

Parasite Identification and Calculation of Prevalence and Mean Intensity of Infection

Parasite species were identified according to Paperna (1996) and Moravec (2019). Prevalence and intensity of infection were calculated for the parasites according to Bush *et al.* (1997).

Results

Two hundred specimens comprised of one hundred individuals of each of *Sarotherodon melanotheron* and *Neochelon falcipinnis* were examined in the course of this research. Results of the research are hereby presented.

Condition Factor and Length-Weight Relationship

The condition factor for Tilapia (*Sarotherodon melanotheron*) ranged from 1.50 - 2.66 with a mean value of 2.02±0.26. *Neochelon falcipinnis* had condition factor ranging from 0.56 to 1.84 with a mean value of 0.94±0.17 (Table 1).

The regression equation for the length-weight relationship of *S. melanotheron* was computed as: Y = -1.298 + 2.635X with a b-value of 2.635 (Fig. 1). For *Neochelon falcipinnis*, the regression equation for the length-weight relationship was computed as Y = -1.748 + 2.760X and a b-value of 2.760 (Fig. 2).

Table 1: Condition factor of *Sarotherodon melanotheron* and *Neochelon falcipinnis* from Creek Road Market, Port Harcourt, Nigeria

	S. melanotheron		***N. falcipinnis***	
	Range	Mean	Range	Mean
Wet body Weight (g)	16.00-67.00	40.40±10.30	13.00-62.00	34.98±13.32
Total Length (cm)	9.00-15.50	12.54±1.08	11.00-19.70	15.28±2.11
Condition factor	1.50-2.66	2.02±0.26	0.56-1.84	0.94±0.17

±standard deviation

Parasites Isolated from Fish Specimens

Three parasite species were isolated from the fish specimens: the parasitic isopod (*Cymothoa exigua*) which was removed from the mouth of *S. melanotheron*, acanthocephalans (*Acanthocephalus* sp.) which were recovered from the intestines of *S. melanotheron* and the marine leech (*Zeylanicobdella arugamensis*) which was the only parasite recovered from the gills of *N. falcipinnis*. The parasite prevalence was very low as only five specimens of

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S. melanotheron were infected and only one *N. falcipinnis* was infected (Table 2).

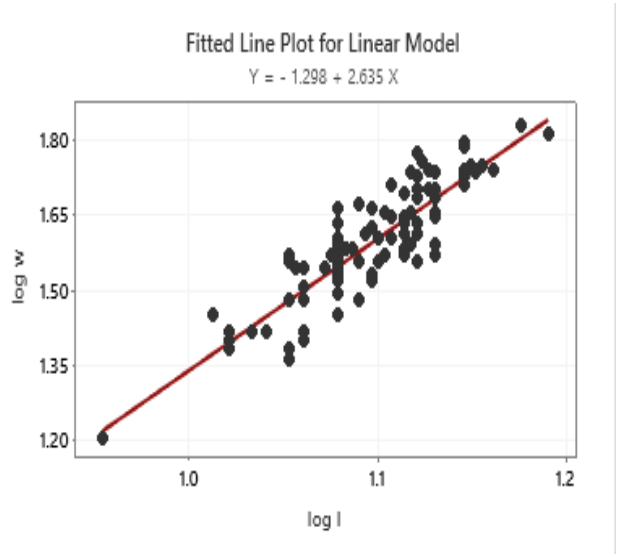

Fig. 1: Length-Weight Relationship of *S. melanotheron* from Creek Road Market, Port Harcourt, Nigeria

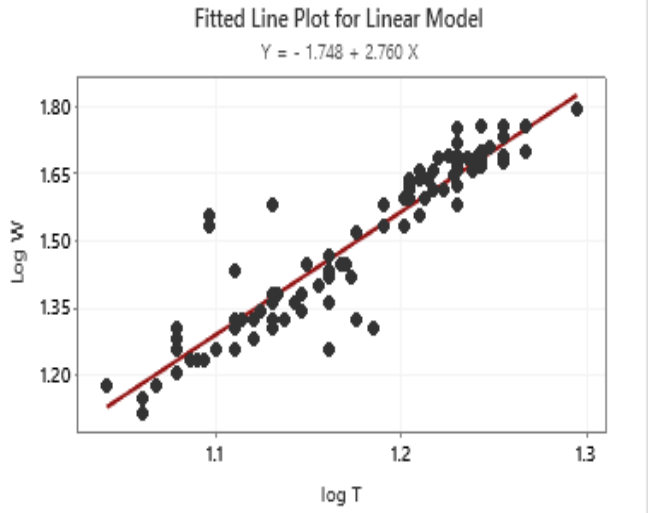

Fig. 2: Length-Weight Relationship of *N. falcipinnis* from Creek Road Market, Port Harcourt, Nigeria

Table 2: Prevalence of Parasite Infection in *Sarotherodon melanotheron* and *Neochelon falcipinnis*, Creek Road Market, Port Harcourt, Rivers State, Nigeria

Parasite	Host Specimen	Predilection Site of Parasite	Total Number of Host Examined	Number of Infected Hosts	Number of Parasites Recovered
Parasitic isopod (*Cymothoa exigua*)	*Sarotherodon melanotheron*	Mouth	100	1	1
Acanthocephalans (*Acanthocephalus* sp.)	*S. melanotheron*	Intestine	100	5	6
Marine leech (*Zeylanicobdella arugamensis*)	*Neochelon falcipinnis*	Gills	100	1	1

Discussion

A condition factor of 1.00 and above is considered healthy for fish species (Ujjania *et al*., 2012). However, values close to 1.00 can also indicate a state of well-being (Jisr *et al*., 2018). In this research, the condition factor ranged from 1.50 - 2.66 in *S. melanotheron* and 0.56-1.84 in *N. falcipinnis*. Thus, *S. melanotheron* were generally in better condition. Since both fish were obtained from the same river, the differences observed may be due to intrinsic factors. For instance, Maguire and Mace (1993) stated that increase in condition factor may be due to the accumulation of fat or gonadal development. It may also reflect the feeding activity of the species or the ability of the fish to convert feed into biomass (Igwela *et al*., 2011).

Both fish species showed negative allometric growth. From the records of the growth coefficient (b-value) of several fish species available at FishBase (www.fishbase.org) database (Froese and Pauly, 2021b), the growth pattern of *S. melanotheron* alternates from negative to positive allometric growth with a b-value of 3.03 (2.88-3.18) and that of *N. falcipinnis* is negative allometric growth with a b-value of 2.95 (2.91-2.99). The results obtained from this research therefore, agree with the records in FishBase. However, the values obtained here are lower than those in the database. Several factors, including season and reproductive cycle, affect the length-weight relationship of fish causing variations in the values. For instance, in their research in fish of the Amazonas, Oliveira *et al*. (2020) reported that lower b-values could be due to season, food availability, population, sex and physiology, and recommended studies involving larger sample sizes to confirm the growth pattern. Jisr *et al*. (2018) found that though most of the fish species they examined presented with negative allometric growth, *Liza ramada* exhibited a positive allometric growth only in the winter while *Oblada*

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melaneura showed a positive allometric growth during the summer, thereby supporting the influence of season on the length-weight relationship of different fisheries. Moslen and Miebaka (2017) examined *Mugil cephalus* and *Oreochromis niloticus* from an estuarine creek in Niger Delta, Nigeria, from January to December, 2015, and reported variations in the growth pattern of *Mugil cephalus*; the species exhibited isometric growth pattern in June but allometric growth pattern during the rest of the research period. *Oreochromis niloticus*, on the other hand, exhibited allometric growth throughout the study period. These reports indicate variability of length-weight relationship both between fish species and between seasons.

Parasite abundance was low in the fish specimens examined with only three parasites encountered- *Cymothoa exigua*, *Acanthocephalus* sp. and *Zeylanicobdella arugamensis*. This could be because only two fish species were examined and interest was limited to ecto-parasites and gastro-intestinal helminth parasites. Ogbeibu *et al*., (2014) examined over fifteen fish species from Buguma Creek and isolated sixty-four nematode parasite species. On the other hand, Nzeako *et al*. (2014) examined *Chrysichthys nigrodigitatus* from New Calabar River and encountered fourteen parasite species including protozoan, crustacean, platyhelminth and nematode parasites. These authors (Nzeako *et al*., 2014), however, examined the blood, heart, liver, kidney and gasto-intestinal tract of the experimental fish species. The marine leech, *Z. arugamensis*, appears to be specific to Neochelon falcipinnis in Rivers State, Nigeria. This parasite was also encountered in *N. falcipinnis* of Abalama and Ilelema locations of the Buguma Creek, Rivers State, Nigeria (Ikiriko *et al*., 2020).

Conclusion

This research has shown that Tilapia (*Sarotherodon melanotheron*) and mullets (*Neochelon falcipinnis*) sourced from Creek Road Market waterfront, Port Harcourt, Nigeria, are in good condition, though *S. melanotheron* had higher values of condition factor than *N. falcipinnis*. Both fishes exhibited negative allometric growth. Three parasites were isolated: *Cymothoa exigua* and *Acanthocephalus* sp. from *S. melanotheron* and *Zeylanicobdella arugamensis* from *N. falcipinnis*. We recommend that, where possible, large number of species and specimens should be examined to enhance parasite isolation.

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