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Omeji S

Department of Fisheries and
Aquaculture, University of
Agriculture, P.M.B. 2373,
Makurdi, Benue State, Nigeria

Obande RA

Department of Fisheries and
Aquaculture, University of
Agriculture, P.M.B. 2373,
Makurdi, Benue State, Nigeria

Gbem BO

Department of Fisheries and
Aquaculture, University of
Agriculture, P.M.B. 2373,
Makurdi, Benue State, Nigeria

Effect of helminth parasitic load on the length weight ratio of *Synodontis resupinata* from rivers Mu and Benue, Makurdi, Nigeria

Omeji S, Obande RA and Gbem BO

Abstract

Helminth parasites of 240 *Synodontis resupinata* comprising of 120 samples each from Rivers Mu and Benue was determined. Of the 120 *S. resupinata* from River Mu, 46.67% fish samples were infested with 59.66% parasites while out of the 120 *S. resupinata* from River Benue, 27.50% fish samples were infested with 40.34% parasites. While higher parasite prevalence of 23.33% and lower mean intensity of 1.27 were recorded for *S. resupinata* from River Mu, lower parasite prevalence of 13.75% and higher mean intensity of 1.45 were recorded for *S. resupinata* from River Benue. Generally, fish samples from River Mu had higher parasite infestation than those from River Benue. Four different parasites; *Diphilobothrium latum*, *Eustrongylides sp.*, *Capilaria philippinensis* and *Neoechinorhynchus rutili* were recorded from the stomach and intestine of *S. resupinata* from Rivers Mu and Benue during the study period. From River Mu, *D. Latum* accounted for the highest percentage parasite species (38.03%) while the lowest (11.27%) was recorded for *N. Rutili* whereas, while *E. Sp* accounted for the highest percentage parasite species from River Benue, *N. Rutili* (10.42%) was the least. Generally, stomach of *S. Resupinata* from River Mu had higher percentage parasite load (47.89%) than the intestine (42.02%). Also, while 54.17% parasite load was recorded for the stomach of fish samples from River Benue, 45.83% was recorded for the intestine. Highest (40.85%) and lowest (11.27%) parasite loads were recorded for length groups of 60.1-75.0cm and 0-15.0cm, respectively for fish samples from River Mu while the highest (27.08%) and lowest (10.42%) parasite loads were also recorded for length groups of 60.1-75.0cm and 0-15.0cm, respectively for fish samples from River Benue. Generally, higher percentage prevalence (46.67%) but lower intensity (1.27) were recorded for *S. resupinata* from River Mu than *S. resupinata* from River Benue with 27.50% prevalence and 1.45 mean intensity. Highest (28.17%) and lowest (14.08%) parasite loads were recorded for weight groups of 251.0-300.0g and 150.0-200.0g, respectively for fish samples from River Mu while the highest (29.17%) and lowest (10.42%) parasite loads were also recorded for weight groups of 251.0-300.0g and 150.0-200.0g, respectively, for fish samples from River Benue. Male *S. resupinata* from Rivers Mu had higher percentage parasite load (63.38%) than the female with 36.62% parasite load. Also, male *S. resupinata* from Rivers Benue had higher percentage parasite load (64.58%) than the female with 35.42% parasite load.

Keywords: Helminth, length weight ratio, *Synodontis resupinata*, rivers mu and benue, Makurdi

1. Introduction

In recent times, interest in the development of fish farming and culture has increased tremendously in Nigeria due to factors such as consumption, scientific studies, economic benefits and ornamental purposes. Nigeria as a country has a large population of domesticated livestock made up of cattle, sheep, goats as well as poultry, which constitute the major source of animal protein to the populace. In spite of these animals' resources, production has remained inadequate in meeting the national protein requirements. However, fish is one of the cheapest sources of animal protein, especially with the rapidly increasing human population and consequent increase in protein demand.

Fish production is affected by several factors among which are parasites (Hassan *et al.* 2010) [12]. Parasitic diseases reduce fish production by affecting the normal physiology of fish and can result in mass mortalities of fish if remained unmonitored (Fagbenro *et al.* 1993).

Many researches on fish parasites have been conducted in Nigeria. Helmintho-fauna infections in fishes have been reported to have marked relationship with sex and size (Guidelli *et al.* 2003; Araoye, 2005; Lizama *et al.*, 2005, 2006; Hassan *et al.* 2010; Omeji, 2012) [11, 1, 14, 13, 12, 19].

The use of Length Wight Ratio for assessment of fish maturity, growth and production is

Correspondence

Omeji S

Department of Fisheries and
Aquaculture, University of
Agriculture, P.M.B. 2373,
Makurdi, Benue State, Nigeria

important and the growth in animals is considered in terms of increase in volume. According to Esiest (2013) [8] parasitic worms can cause swollen abdomen in fishes thereby contributing to both pseudo-weight and length of fishes and can also lead to stunted growth thereby reducing the length and weight of the fish.

In spite of the high abundance and commercial value of *Synodontis resupinata* in the day to day catches of artisan fishermen from Rivers Mu and Benue, there is still dearth of documented work(s) on the parasite fauna of this importance species. It is base on these that this work was carried out to reveal the possible helminth parasites of *S. resupinata*.

Materials and Methods

Collection of fish samples, identification and examination for parasites

240 samples of *S. resupinata* comprising of 120 samples each from River Mu and River Benue were bought monthly and taken to the Fisheries laboratory, University of Agriculture, Makurdi, Benue State, Nigeria. The samples were identified and sexed into male and female. The standard and total length of the fish samples were recorded in centimetres using a meter rule. The fish samples were examined for the presence of helminth parasites by adopting the methods employed by Fish specimens were dissected out in physiological saline (0.75% NaCl solution) for collecting helminth parasites. Taxonomical identification of helminth parasites was done by adopting the works of Yamaguti (1959) [23].

Statistical Analysis

Analysis of parasitic infestation to determine the prevalence and intensity were done using the equations by

$$\text{Prevalence (\%)} = \frac{\text{Numberoffish infected}}{\text{numberoffish examined}} \times 100$$

$$\text{Mean Intensity} = \frac{\text{Total Number of Parasites}}{\text{Number of fish infested}}$$

The relationships between factors such as host sex, weight, total length, and parasitic infestation were obtained from pooled data using analysis of variance (ANOVA). All statistical analysis was done using SPSS version 17.0

Results

Results of the prevalence of endoparasitic fauna according to the rivers sampled are shown in Figure 1. Of the 120 *S. resupinata* from River Mu, 46.67% fish samples were infested with 59.66% parasites. While out of the 120 *S. resupinata* from River Benue, 27.50% fish samples were infested with 40.34% parasites. While higher parasite prevalence of 23.33% and lower mean intensity of 1.27 were recorded for *S. resupinata* from River Mu, lower parasite prevalence of 13.75% and higher mean intensity of 1.45 were recorded for *S. resupinata* from River Benue. Generally, fish samples from River Mu had higher parasite infestation than those from River Benue.

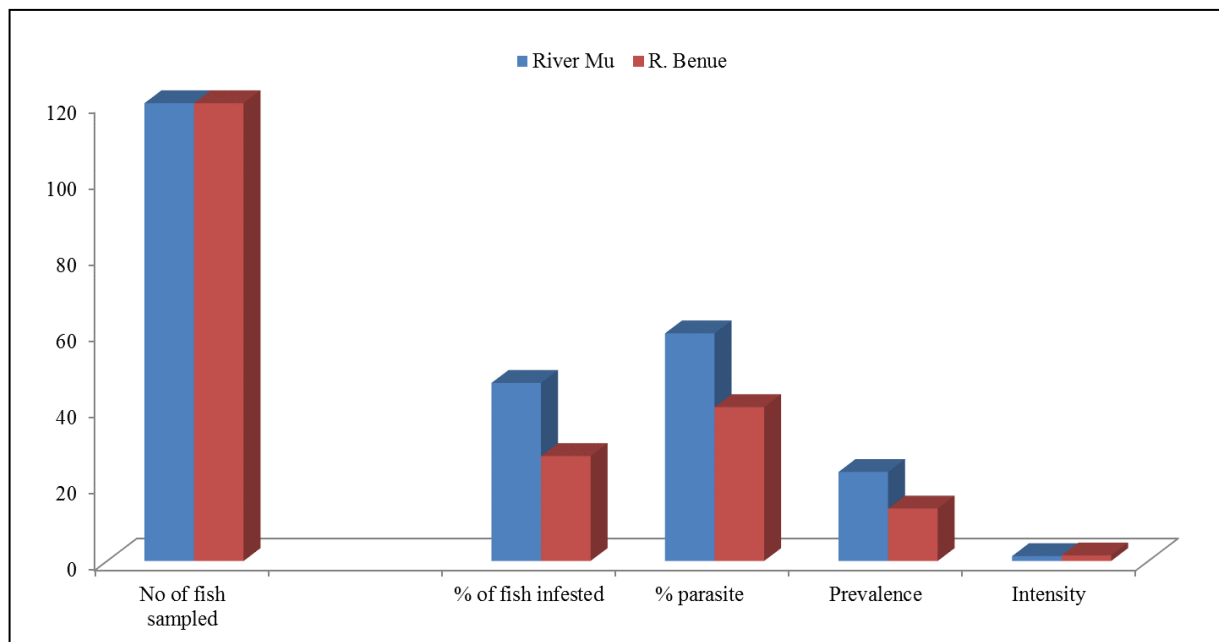


Fig 1: Prevalence of endoparasitic fauna according to the rivers sampled

Results of the prevalence of endoparasitic fauna in relation to site of infection of *S. resupinata* from Rivers Mu and Benue are shown in Table 1. Four different parasites which include *Diphilobothrium latum*, *Eustrongylides sp*, *Capilaria philippinensis* and *Neoechinorhinchus rutili* were recorded from stomach and intestine of *S. resupinata* from Rivers Mu and Benue during the study period.

From River Mu, *D. Latum* accounted for the highest percentage parasite species (38.03%) while the lowest

(11.27%) was recorded for *N. Rutili* whereas, while *E. Sp* accounted for the highest percentage parasite species from River Benue, *N. Rutili* (10.42%) was the least.

Generally, stomach of *S. Resupinata* from River Mu had higher percentage parasite load (47.89%) than the intestine (42.02%). Also, while 54.17% parasite load was recorded for the stomach of fish samples from River Benue, 45.83% was recorded for the intestine.

Table 1: Prevalence of endoparasitic fauna in relation to site of infection of *S. resupinata* from Rivers Mu and Benue

Parasites	Site of Infestation	Rivers					
		River mu			River Benue		
		% of fish infested	% parasite recovered	% parasite species	% fish infested	% parasite recovered	% parasite species
<i>D. latum</i>	Stomach	8.93	8.45	38.03	9.09	10.42	31.25
	Intestine	30.36	29.58		18.18	20.83	
<i>Eustrongylides sp</i>	Stomach	23.21	21.13	30.99	33.33	33.33	33.33
	Intestine	7.14	9.86		0.00	0.00	
<i>C. philippinensis</i>	Stomach	5.36	7.04	19.72	0.00	0.00	25.00
	Intestine	12.50	12.68		27.27	25.00	
<i>N. rutili</i>	Stomach	12.50	11.27	11.27	9.09	10.42	10.42
Total		100.00	100.00	100.00	100.00	100.00	100.00

Results of the prevalence of endoparasitic fauna in relation to total length (cm) of *S. resupinata* from Rivers Mu and Benue are presented in Table 2. Highest (40.85%) and lowest (11.27%) parasite loads were recorded for length groups of 60.1-75.0cm and 0-15.0cm, respectively for fish samples from River Mu while the highest (27.08%) and lowest (10.42%) parasite loads were also recorded for length groups of 60.1-

75.0cm and 0-15.0cm, respectively for fish samples from River Benue.

Generally, higher percentage prevalence (46.67%) but lower intensity (1.27) were recorded for *S. resupinata* from River Mu than *S. resupinata* from River Benue with 27.50% prevalence and 1.45 mean intensity.

Table 2: Prevalence of endoparasitic fauna in relation to total length (cm) of *S. resupinata* from Rivers Mu and Benue

Length (Cm)	River Mu					River Benue				
	% of fish examined	% fish infested	% of recovered parasites	Prevalence	Intensity	% of fish examined	% fish infested	% recovered parasites	Prevalence	Intensity
0-15	14.17	5.36	11.27	17.65	2.67	12.50	6.06	10.42	13.33	2.50
15.1-30	19.17	14.29	12.68	34.78	1.13	17.50	12.12	16.67	19.05	2.00
30.1-45	14.17	16.07	15.49	52.94	1.22	34.17	21.21	20.83	17.07	1.43
45.1-60	21.67	21.43	19.72	46.15	1.17	21.67	27.27	25.00	34.62	1.33
60.1-75	30.83	42.86	40.85	64.86	1.21	14.17	33.33	27.08	64.71	1.18
Total	100.00	100.00	100.00	46.67	1.27	100.00	100.00	100.00	27.50	1.45

Results of the prevalence of endoparasitic fauna in relation to weight (grams) of *S. resupinata* from Rivers Mu and Benue are presented in Table 3. Highest (28.17%) and lowest (14.08%) parasite loads were recorded for weight groups of 251.0-300.0g and 150.0-200.0g, respectively for fish samples

from River Mu while the highest (29.17%) and lowest (10.42%) parasite loads were also recorded for weight groups of 251.0-300.0g and 150.0-200.0g, respectively, for fish samples from River Benue.

Table 3: Prevalence of endoparasitic fauna in relation to weight (g) of *S. resupinata* from Rivers Mu and Benue

Weight (g)	River Mu					River Benue				
	% of fish examined	% fish infested	% of recovered parasites	Prevalence	Intensity	% of fish examined	% fish infested	% of recovered parasites	Prevalence	Intensity
150-200	14.17	14.29	14.08	47.06	1.25	12.50	12.12	10.42	26.67	1.25
201-250	17.50	17.86	18.31	47.62	1.30	19.17	15.15	16.67	21.74	1.60
251-300	30.83	28.57	28.17	43.24	1.25	33.33	33.33	29.17	27.5	1.27
301-450	19.17	23.21	23.94	56.52	1.31	20.83	21.21	25.00	28.00	1.71
451-500	18.33	16.07	15.49	40.91	1.22	14.17	18.18	18.75	35.29	1.50
Total	100.00	100.00	100.00	46.67	1.27	100.00	100.00	100.00	27.50	1.45

Results of the prevalence of endoparasitic fauna in relation to sex of *S. resupinata* from Rivers Mu and Benue are presented in Table 4. Male *S. resupinata* from Rivers Mu had higher percentage parasite load (63.38%) than the female with

36.62% parasite load. Also, male *S. resupinata* from Rivers Benue had higher percentage parasite load (64.58%) than the female with 35.42% parasite load.

Table 4: Prevalence of endoparasitic fauna in relation to sex of *S. resupinata* from Rivers Mu and Benue

Fish species/ Rivers	Infected	% parasite infestation	Prevalence	Intensity
Male <i>S. resupinatus</i> , River Mu	57.14	63.38	26.67	1.41
Female <i>S. resupinatus</i> , River Mu	42.86	36.62	20.00	1.08
Male <i>S. resupinatus</i> , River Benue	42.42	147.92	11.67	1.21
Female <i>S. resupinatus</i> , River Benue	57.58	35.42	15.83	1.63

Discussion

The present study revealed an overall infection rate of 37.08% in *S. resupinata* examined from River Mu and River Benue. This finding is higher than 33.5% overall infection rate in *Chrysichthys nigrodigitatus* examined from Great Kwa River and Calabar River as reported by Cletus *et al.*, (2016)^[6], 12.7 reported by Akinsanya *et al.*, (2007)^[2] at Lekki, Lagos State; 3.33% by Ekanem *et al.*, (2011)^[7] at Great Kwa River, Calabar, Cross River State; 20.0% by Sidney *et al.*, (2014)^[20] at new Calabar, Rivers State. In this study, two genera of parasites (Cestoda, Nematoda and Acanthocephalans) were extracted from *S. resupinata* organs. The cestodes include *Diphyllobothrium latum*, nematodes were *Eustrongylides sp* and *Capillaria philippinensis* while the acanthocephalans includes *Neoechinorhynchus rutili*. The recovery of *Diphyllobothrium latum*, *Capillaria philippinensis* and *Neoechinorhynchus rutili* (an acanthocephalan) from *S. resupinata* is not surprising as they had been recovered from *C. nigrodigitatus* from Great Kwa River and Calabar River (Cletus *et al.* 2016)^[6]. The nematodes were the highest occurring parasites, followed by the cestodes and finally the acanthocephalans. This agrees with the reported work of Cletus *et al.*, (2016)^[6]. Highest number of parasites was harboured in the intestine compared to the stomach of the fish. The presence of these parasites in the intestine than the stomach might be due to the presence of digested food present there or due to greater surface area present in the intestine. Reported that most parasites inhabit the intestine because of their general feeding habits. Highest number of parasites in the intestine compared to the stomach of the fish agrees with the earlier reports by Akinsanya *et al.*, (2007)^[2], Ekanem *et al.*, (2011)^[7] and Sidney *et al.*, (2014)^[20], who held that most digestive activities occur in the intestine, resulting in the presence of absorbable food nutrient on which nematodes depend.

It was not surprising to find *Eustrongylides sp* in the fish species in the fish sampled from River Mu and River Benue because of the presence of aquatic birds around the river. Omeji *et al.*, (2013)^[17] reported that aquatic birds are important in the ecology of fish parasites because most helminth complete their life cycles in the host birds.

Sex related infection shows that male had more overall infection (51.69%) compared to the female counterparts (48.31%). There was no statistical significant difference ($p > 0.05$) in the infection of males than females in this study as earlier observed by Cletus *et al.*, (2016)^[6] and Sikoki *et al.*, (2013). However, the higher overall infection in male than the female in this work is at variance with the observation of Ekanem *et al.*, (2011)^[7] and Uneke *et al.*, (2015)^[22] but agrees with the work of Awharitoma and Okaka (2000)^[3], and Omeji *et al.*, (2013)^[17], who reported more infection in males than females.

The low infestation rate of fish from River Benue compared to River Mu could be due to its sanitary condition, higher volume and flowing capacity, low visitation of people for laundry, and defecation, which is the reverse in River Mu, hence higher infestation of fish. This assertion is in line with the reported work of Cletus *et al.*, (2016)^[6], Ekanem *et al.*, (2011)^[7] in Calabar, Cross River State.

Prevalence of parasitic infection according to the size (total length and weight) of *S. resupinatus* showed an increased infection in bigger fishes (> 50.00cm and 200g) than smaller ones (< 50) The recorded highest infection rates in bigger fishes of length range (> 50.00cm and 200g) from River Mu

compared to River Benue, respectively. This is in agreement with the universal pattern of parasitic infection in fishes (Bello-Olusoji *et al.* 2011; Ekanem *et al.* 2011; Chowdhury and Hossain, 2015)^[4, 7, 5]. The increase in parasitic infection as fish age increases is attributable to wide range search for food which predisposes them to infection. The recorded highest parasitic infection rate in weight range of River Mu and River Benue could be due to their great search for food and survival needs. This finding is in contrast with the reported work of Ekanem *et al.*, (2011)^[7] who revealed highest infection rate in lower length class.

Differences in the prevalence of endoparasitic fauna in male and female of *S. resupinata* from River Mu and River Benue could be as a result of their physiological state. According to, the main reason for the differences in parasitic load with sex is physiological. Also stated that females are more susceptible to parasite infection during breeding seasons, that most gravid females could have had reduced resistance to infection by parasites. In addition their increased rate of food intake to meet requirements for the development of their egg might have exposed them to more contact with parasite which subsequently increased their chances of been infected. Omeji *et al.*, (2011)^[18] also made similar observations.

Conclusion

River Mu had higher endoparasitic prevalence but lower intensity than River Benue. Male *S. resupinata* from River Mu were more infested than female but this is in reverse of River Benue. Parasitic intensity of male *S. resupinata* from River Mu was higher than the male counterpart whereas, female *S. resupinata* from River Benue had greater intensity than the male. Of the parasites encountered, *Eustrongylides sp* was most prevalent.

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