

Diversity and Infection Patterns of Parasites in *Synodontis Schall* from Taylor Creek, Bayelsa State, Nigeria

Kuroakongha Rena Oweibi*¹ and Abiodun Oluseye Adeyemo²

^{1,2}Department of Fisheries, Faculty of Agriculture,
Niger Delta University, Wilberforce Island,
P.M.B. 071, Yenagoa, Bayelsa State, Nigeria.

*Corresponding Author's Email: oweibirena@gmail.com

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Abstract

Synodontis schall is an important freshwater fish species that supports artisanal fisheries across many African inland waters and is susceptible to infections by a variety of fish parasites. This study investigated the prevalence, mean intensity, diversity, and infection patterns of parasites infecting *S. schall* from Taylor Creek, Bayelsa State, Nigeria. Thirty fish specimens were collected between April and December 2024 and examined using standard parasitological procedures. Recovered parasites were identified morphologically, and prevalence, mean intensity, and Shannon–Wiener diversity were determined. The relationship between parasite burden and host biometrics was evaluated using Spearman's rank correlation. Four parasite taxa were recovered: *Camallanus* sp., *Clinostomum* sp., *Hexamita* sp., and *Procamallanus* sp. Overall parasite prevalence was 56.7% (95% CI: 39.2–72.6%), with a mean intensity of 6.9 parasites per infected fish; no fish showed co-infection with more than one parasite taxon. The parasite community had a Shannon–Wiener diversity index (H') of 1.24 — close to the maximum value of 1.39 possible for four taxa — reflecting low species richness but high evenness ($J' = 0.90$) among the taxa recovered. Parasite burden was not significantly correlated with total length or body weight ($p > 0.05$). These findings provide baseline parasitological data for *S. schall* in Taylor Creek, a freshwater ecosystem for which such information has previously been unavailable.

Keywords: *Synodontis schall*; fish parasites; parasite diversity; prevalence; Taylor Creek; Nigeria.

Introduction

Synodontis schall is a widely distributed freshwater catfish inhabiting rivers, lakes, and floodplain systems across Africa, where it contributes to artisanal fisheries and local food security. Its ecological adaptability, commercial importance, and widespread occurrence have made it an important component of inland fisheries in many African countries (Arame et al., 2021). Fish parasites are important components of aquatic ecosystems and may influence fish health, growth, reproduction, and survival, with potential consequences for fisheries productivity and fish quality. Parasite occurrence and community composition are shaped by interactions among the host, parasite, intermediate hosts, and environmental conditions, resulting in variation in parasite diversity and infection patterns across freshwater ecosystems (Giari et al., 2021; Poulin & Morand, 2005).

In Nigeria, *S. schall* has been reported to harbour a variety of ectoparasites, endoparasites, and haemoparasites from different freshwater systems. Studies from the Cross River Estuary and

Otuogori River have shown that parasite composition and infection patterns differ among locations (Effanga & Eyo, 2018; Ezenwaka & Nweke, 2021; Ezenwaka & Living-Jamala, 2024), highlighting the influence of local ecological conditions on parasite transmission. Taylor Creek is an ecologically important freshwater system in the Niger Delta that supports diverse aquatic organisms and artisanal fisheries (Akani et al., 2014; Alagoa et al., 2019). However, published information on the diversity and infection patterns of parasites infecting *S. schall* from this ecosystem remains limited. This study therefore investigated the diversity and infection patterns of parasites infecting *S. schall* from Taylor Creek, Bayelsa State, Nigeria, by determining parasite prevalence, mean intensity, species diversity, and the relationship between parasite burden and host biometric characteristics.

Materials and Methods

The study was conducted in Taylor Creek around Polaku, Bayelsa State, Nigeria (5°01'–5°02' N, 6°17'–6°18' E) as presented in figure 1. Taylor Creek is a freshwater tributary of the Nun River within the Niger Delta and supports artisanal fisheries and diverse freshwater fish communities (Alagoa et al., 2019).

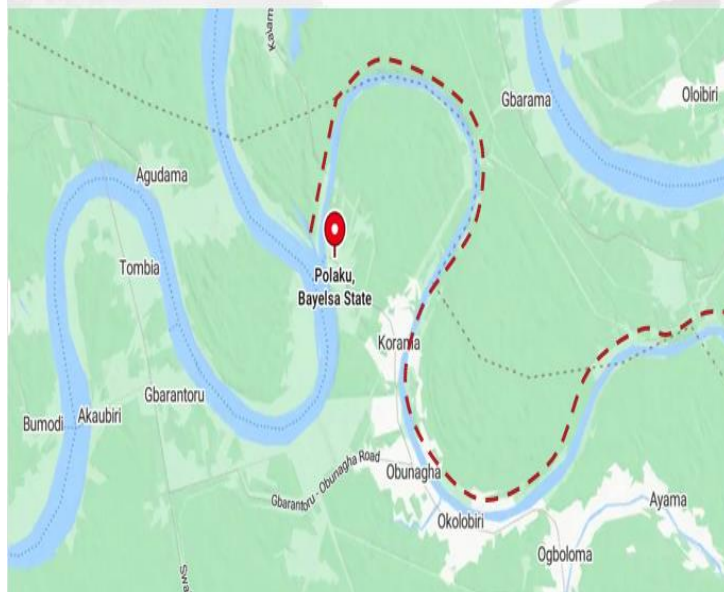


Figure 1. Map of Taylor Creek around Polaku, Bayelsa State, Nigeria, showing the sampled stretch of the creek (dotted line). Base map adapted from Google Maps (2026).

A total of 30 specimens of *Synodontis schall* were collected from artisanal fishers in Taylor Creek between April and December 2024 using gill nets and traps. Fish were placed in ice-filled containers immediately after capture and transported to the laboratory for identification and parasitological examination. Fish specimens were identified using standard fish identification keys (Froese & Pauly, 2020; Olaosebikan & Raji, 2013). Total length (cm) and body weight (g) were recorded, each fish was examined externally for parasites on the skin, fins, eyes, opercula and gills. Gill filaments were examined in physiological saline (0.9% NaCl) under a light microscope prior to dissection. The abdominal cavity was opened by a mid-ventral incision, and the stomach, intestine and body cavity were examined separately for endoparasites. Recovered parasites were counted, preserved in 70% ethanol and identified to the lowest possible taxonomic level based on morphological characteristics using the identification keys of Paperna (1996) and Eiras et al. (2006).

Data Analysis

Prevalence, mean intensity and mean abundance were calculated according to Bush et al. (1997), and 95% confidence intervals for prevalence were calculated using the Wilson score method. Species richness, Shannon–Wiener diversity (H') (Shannon, 1948) and Pielou's evenness (J') (Pielou, 1966) were used to describe parasite community structure. Parasite burden was defined as the total number of parasites recovered from each individual fish. The relationship between parasite burden and fish size (total length and body weight) was evaluated using Spearman's rank correlation coefficient in IBM SPSS Statistics version 23, with statistical significance accepted at $p < 0.05$.

Results

Seventeen (56.7%) of the 30 *Synodontis schall* examined were infected with at least one parasite species (95% CI: 39.2–72.6%). A total of 118 parasites representing four parasite taxa were recovered from infected fish, giving mean intensity of 6.9 parasites per infected fish. Every infected fish carried only a single parasite taxon; no co-infections involving more than one parasite species were observed in this sample. *Procamallanus sp.* was the most prevalent parasite (23.3%, 95% CI: 11.8–40.9%) and also recorded the highest mean abundance (1.67 parasites per fish examined). Although *Hexamita sp.* occurred in fewer fish (13.3% prevalence, 95% CI: 5.3–29.7%), it exhibited the highest mean intensity (9.75 parasites per infected fish). *Clinostomum sp.* and *Camallanus sp.* each had a prevalence of 10.0% (95% CI: 3.5–25.6%), but *Clinostomum sp.* showed a higher mean intensity (6.33) than *Camallanus sp.* (3.33) (Table 1).

Table 1. Prevalence, mean intensity and mean abundance of parasite species infecting *Synodontis schall*

Parasite species	No. of infected fish	Total parasites recovered	Prevalence (%)	Mean intensity	Mean abundance
<i>Procamallanus sp.</i>	7	50	23.3	7.14	1.67
<i>Hexamita sp.</i>	4	39	13.3	9.75	1.30
<i>Camallanus sp.</i>	3	10	10.0	3.33	0.33
<i>Clinostomum sp.</i>	3	19	10.0	6.33	0.63

The parasite community infecting *Synodontis schall* comprised four parasite taxa, corresponding to a species richness (S) of 4. The Shannon–Wiener diversity index (H') was 1.24, close to the maximum value of $\ln(4) = 1.39$ attainable for a community of four taxa, while Pielou's evenness index (J') was 0.90 (Table 2).

Table 2. Diversity indices of the parasite community infecting *Synodontis schall*

Diversity index	Value
Species richness (S)	4
Shannon–Wiener diversity index (H')	1.24
Pielou's evenness (J')	0.90

Spearman's rank correlation analysis revealed a very weak negative relationship between parasite count and total length ($r_s = -0.085$, $p = 0.654$), and between parasite count and body weight ($r_s =$

-0.115, $p = 0.545$). Neither relationship was statistically significant, indicating that parasite burden was not significantly associated with fish size in *Synodontis schall* (Table 3).

Table 3. Relationship between parasite burden and morphometric characteristics of *Synodontis schall*

Variable pair	Spearman's r_s	p-value
Parasite count vs Total length	-0.085	0.654
Parasite count vs Weight	-0.115	0.545

Discussion

The present study demonstrated that 56.7% of *Synodontis schall* examined from Taylor Creek, Bayelsa State, Nigeria, were infected with at least one parasite taxon, with a total of 118 parasites recovered and an overall mean intensity of 6.9 parasites per infected fish. This relatively high prevalence is comparable to that reported for *S. schall* from the Otuogori River, Bayelsa State, where parasite infections were likewise common (Ezenwaka & Living-Jamala, 2024). However, the parasite composition differed from that reported in the Cross-River Estuary, southeastern Nigeria, where a different assemblage of endoparasites predominated (Effanga & Eyo, 2018). Such geographical variation is expected because parasite communities are shaped by local environmental conditions, host feeding ecology, intermediate host availability, and other ecological factors that influence parasite transmission (Giari et al., 2021). In the present study, *Procamallanus* sp. was the most prevalent parasite, whereas *Hexamita* sp. exhibited the highest mean intensity despite infecting fewer hosts, suggesting differences in infection dynamics and parasite establishment within infected fish. No co-infections involving more than one parasite taxon were observed among the examined fish. The parasite community exhibited a Shannon–Wiener diversity index (H') of 1.24 and a Pielou's evenness index (J') of 0.90, indicating a moderately diverse parasite assemblage in which the recovered parasite taxa were relatively evenly distributed despite differences in their prevalence. Similar studies conducted in other Nigerian freshwater systems have likewise shown that *S. schall* supports diverse parasite communities, although parasite composition and infection patterns vary among locations. For example, Effanga and Eyo (2018) reported a diverse endoparasite fauna in *S. schall* from the Cross-River Estuary, southeastern Nigeria, whereas Ezenwaka and Nweke (2021) and Ezenwaka and Living-Jamala (2024) documented different parasite assemblages in fish from the Otuogori River, Bayelsa State. Comparable geographical variation has also been reported in other freshwater fishes from Nigeria (Onoja-Abutu et al., 2021), highlighting the influence of local ecological conditions on parasite community structure. The predominance of *Procamallanus* sp. in Taylor Creek may reflect favourable environmental conditions and the availability of suitable intermediate hosts required for completion of its life cycle. In contrast, although *Hexamita* sp. infected relatively few fish, infected individuals harboured comparatively heavy parasite burdens, resulting in the highest mean intensity among the parasite taxa recovered. This disparity between prevalence and mean intensity demonstrates that parasite prevalence alone may not adequately describe infection dynamics within host populations, as parasites occurring in relatively few hosts may nevertheless impose substantial burdens on infected individuals. Such variation in infection parameters has been reported in freshwater fish parasite communities and may be associated with differences in parasite biology, transmission efficiency, host feeding behaviour, and host susceptibility (Poulin & Morand, 2005). Parasite burden was not significantly associated with either total length or body weight of *S. schall*, suggesting that host size had limited influence on parasite burden within the

examined population. This finding agrees with observations from the Otuogori River, Bayelsa State, where Ezenwaka and Living-Jamala (2024) likewise reported no significant relationship between host morphometric characteristics and parasite infection in *S. schall*. Differences among studies are nevertheless expected because parasite acquisition is influenced by a combination of ecological and biological factors, including habitat characteristics, seasonality, feeding behaviour, and exposure to infective stages, rather than host size alone. Collectively, the present findings highlight the parasite diversity and infection characteristics of *S. schall* in Taylor Creek and provide a basis for comparison with future studies in the Niger Delta.

Conclusion

This study demonstrated that *Synodontis schall* from Taylor Creek harboured four parasite taxa, with *Procamallanus* sp. being the most prevalent and *Hexamita* sp. exhibiting the highest mean intensity. The parasite community showed high evenness despite its relatively low species richness, while parasite burden was not significantly associated with host length or body weight. No co-infections were observed among the fish examined. These findings improve our understanding of the parasite fauna and infection patterns of *S. schall* in Taylor Creek and contribute to the limited knowledge of freshwater fish parasites in the Niger Delta. Future investigations incorporating seasonal sampling and molecular approaches to parasite identification would further improve understanding of parasite diversity, host–parasite interactions, and transmission dynamics in this freshwater ecosystem.

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