Journal of Applied Biosciences 214: 22675 – 22688
ISSN 1997-5902

Ecological insights into Nile tilapia *Oreochromis niloticus* (Linnaeus, 1758) gill monogenean parasites interactions in the Taabo man-made lake (Côte d'Ivoire)

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Submitted 21/08/2025, Published online on 30/11/2025 in the https://www.m.elewa.org/journals/journal-of-applied-biosciences-about-jab/ https://doi.org/10.35759/JABs.214.1

ABSTRACT
Objectif : This study was conducted in the Taabo man-made lake to assess the specific composition, spatio-temporal dynamics and impact of gill Monogenean parasites on the physical condition of *O*reochromis *niloticus*
Methodology and results : Fish sampling was carried out between May 2023 and April 2024 at Ahondo and Couurandjourou stations. A total of eight monogenean species from the genera *Cichlidogyrus* and *Scutogyrus* were identified among the 1180 specimens examined. Fishes captured at the Ahondo station were significantly most infested, with prevalence rates reaching 71.19% for *Cichlidogyrus thurstonae*, 68.64% for *C. sclerosus*, and 63.56% for *C. halli*. At this station, mean parasite intensities were also high, exceeding 50 parasites per individual for certain species. In terms of abundance, peak values at the Ahondo station reached 53.39 for *C. sclerosus* and 52.0 for *C. thurstonae*. These infestations were notably more severe during the rainy seasons. The mean condition factor of infected fish was significantly the lowest at Ahondo station (0.36 ± 0.01) compared to uninfected individuals (0.75 ± 0.10).
Conclusion and application of results: These findings highlighted a higher parasitic pressure at Ahondo station, particularly during the rainy season, and a marked detrimental effect on the health status of infected *O. niloticus*.
Key words : *Oreochromis niloticus*, gill Monogeneans, Infestation, Condition factor, Taabo lake, Côte d'Ivoire.

INTRODUCTION
Oreochromis niloticus (Linnaeus, 1758), a member of the family Cichlidae, is a widely distributed freshwater fish species of significant ecological and economic importance. It is widely distributed and farmed across various regions of the world,

particularly in Asia, Europe and Africa (Gómez-Márquez *et al.,* 2003 ; Sandoval-Gío *et al.,*2008). Its high economic value, rapid growth rate, and tolerance to various environmental conditions make it a preferred species for aquaculture and artisanal fisheries (Amoussou *et al.,* 2014 ; FAO, 2020).This species plays a fundamental role in food security for many populations. However, *O. niloticus* is frequently infested by Monogeneans ectoparasites highly specialized on fish and primarily located on the gills. In aquaculture systems, these parasites can cause epizootics that severely compromise fish health and reproduction. Indeed, Monogeneans attach to their hosts using hooks and suckers, leading to gill damage, respiratory distress, and excessive mucus production, which can result in mortality (Obiekezie, 2006). Therefore, controlling parasitic infections is essential for the success of aquaculture practices (Euzet & Pariselle, 1996). In other countries of Africa, studies on gill Monogeneans of *O. niloticus* have predominantly focused on faunistic inventories and taxonomy (Pariselle & Euzet, 2009 ; El Hafidi *et al.,* 2013), while ecological studies crucial for understanding parasite community structuring and for developing effective management strategies remain scarce. However, in Côte d'Ivoire, available data on *O. niloticus* infestations are limited to studies conducted by Blahoua et al. (2020) in Lake Ayamé, and by Adou et al. (2021) in the Agnéby River. To date, in the Taabo man-made lake, a highly disturbed ecosystem experiencing strong anthropogenic impacts, *O. niloticus* populations remain under considerable ecological and environmental stress. These environmental disturbances create favorable circumstances for the emergence and spread of pathogenic organisms. Fish collected from this man-made lake often exhibit alarming clinical signs, including emaciation, physical deterioration, and gill damage, leading to their rejection during fisheries operations. This situation has significant economic and social consequences for local communities that rely heavily on the lake's fish resources. The present study aimed to characterize the gill Monogenean fauna of *Oreochromis niloticus* in the Taabo man-made lake in order to improve the understanding of parasitic dynamics and its impact on this fish health in this compromised ecosystem and to inform aquaculture management strategies used in such conditions.

MATERIALS AND METHODS

Study Area: The Taabo man-made lake is located between longitudes 5°47' W and 5°90' West and latitudes 6°10' and 6°47' North (Figure 1). It lies along the principal channel of the Bandama River, roughly 110 km below the junction of the White and Red Bandama tributaries. The lake covers an area of 69 km², with a drainage basin estimated at 58.700 km² and an average annual flow rate of 128.7 m³/s (Kouassi, 2007; Aliko *et al.,* 2010). It has an elongated morphology along a northwest-southeast axis, with a single secondary arm extending eastward. Climatically, the northern part of the basin is influenced by a transitional tropical regime (Brou *et al.,* 2005). The lake region is subject to a transitional equatorial climate, featuring two distinct rainy periods (April–June and September–November) alternating with two dry intervals (December–March and July–September). This study was conducted at two distinct locations, Ahondo and Courandjourou. The Ahondo station (between 6°17' N and 6°47' N ; 5°48' W and 5°57' W) is heavily colonized by aquatic vegetation, especially water hyacinth, which covers approximately 8% of the lake's surface area. The substrate is predominantly sandy, with areas of mud deposits and submerged deadwood. The locality is adjacent to yam and cocoa plantations and a protected forest area, with an average water depth of about 6 meters. The Courandjourou site (6°13'N and 6°16'N ;

5°57'W and 5°80'W), located close to the shoreline, is characterized by a reduced forest cover, estimated at 5%. It is surrounded by cocoa and plantain plantations and remnants of forest. The substrate is mainly sandy, mixed with mud, white clay, and woody debris, which hinders navigation. Water at this site reaches an average depth of 7.25 meters.

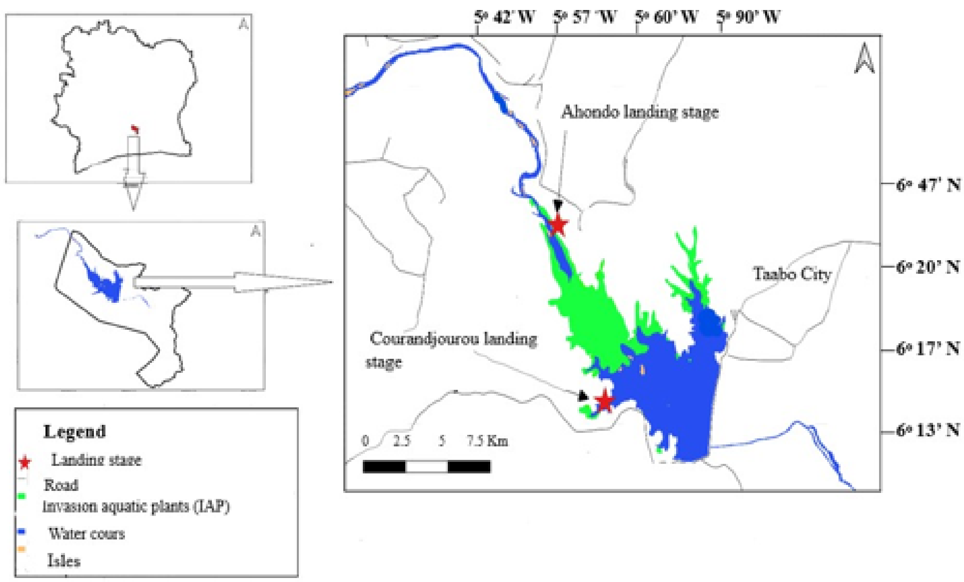

Figure 1 : Map of Taabo man made lake and the sampling stations

Fish Collection: Fish sampling was conducted between May 2023 and April 2024 at designated stations within the Taabo man-made lake. Specimens were collected by local fishers employing gill nets. At each sampling station, 590 specimens of *Oreochromis niloticus* were colleted. On-site species identification was carried out using the dichotomous key provided by Teugels & Thys van den Audenaerde (2003). Gill arches were carefully dissected, individually labeled according to each specimen and preserved in ice (0 °C) before being transported to the laboratory. Upon arrival, the samples were refrigerated until further parasitological analysis.

Condition factor (K): The Fulton's condition factor (K), which relates a fish's weight to the cube of its length, was employed to evaluate the overall health status of individuals and the population as a whole. For each specimen, measurements were taken of total length, standard length, and body mass. An allometric model with a constant exponent *b* was applied to evaluate and compare the condition indices among the different fish categories. The condition factor (*K*) was determined according to the formula proposed by Le Cren (1951):

$K = W*100/ L^b$ (Le Cren, 1951)

where *W* represents the fish weight (g), *L* the standard length (cm), and *b*-the allometric coefficient-is assumed to be 3. To express the condition index on a standardized scale, the calculated value was multiplied by 100. A coefficient close to 1 reflected a normal physiological state, values above 1 indicated well-nourished individuals, while values below 1 denoted skinny fish. This morphometric indicator is based on the premise that, for a given length, individuals with higher body mass are in superior physiological condition.

Parasitological Examination: After thawing, the gill tissues were examined under a light microscope. Monogeneans observed on the gill surfaces were collected using an entomological needle mounted on a handle. Specimens were then mounted on glass slides in a drop of ammonium picrate–glycerin solution, following the protocol described by Malmberg (1957). The preparations were sealed with Glyceel and examined under a compound microscope. Parasite identification was performed based on the morphology and/or measurements of sclerotized structures of the haptoral and copulatory complexes, in accordance with the taxonomic criteria established by Pariselle & Euzet (2009). The ecological parameters used prevalence, mean intensity, and abundance were defined following the guidelines of Bush et al. (1997). Parasite species were classified according to prevalence as follows (Valtonen *et al.,* 1997). Common or core species: prevalence > 50%, Intermediate or secondary species: prevalence between 10% and 50% and Rare or satellite species: prevalence < 10%.

Statistical Analysis: Comparisons among two or more proportions were performed using the chi-square (χ^2) test to assess statistical significance. Comparisons of mean intensities among multiple groups were conducted using the nonparametric Kruskal–Wallis test. Pairwise comparisons were carried out using the Mann–Whitney *U* procedure to assess differences between the groups. Statistical analyses were conducted with STATISTICA 7. Differences were considered statistically significant at $p < 0.05$.

RESULTS

Specific Composition: Morphological characterization of gill parasites from 1180 specimens of *Oreochromis niloticus* collected at the Ahondo and Courandjourou stations revealed eight Monogenean species assigned to the genera *Cichlidogyrus* and *Scutogyrus*. Eight Monogenean species were recorded, notably *Cichlidogyrus tilapiae* and *Scutogyrus longicornis*, occurring in *O. niloticus* across the two investigated stations.

Spatial variation of epidemiological indices of gill Monogeneans in *Oreochromis niloticus:* The Table 1 presents the variations in parasitic indices according to the sampling stations. At Ahondo, *Cichlidogyrus rognoni* (35.08%) and *C. cirratus* (35.42%), *C. thurstonae* (71.19%), *C. sclerosus* (68.64%), *C. tiberianus* (35.56%), *C. halli* (63.56%) and *C. tilapiae* (61.02%) exhibited the greatest infection prevalences among the recorded species. In contrast, the highest prevalence of *Scutogyrus longicornis* (57.12%) was observed at the Courandjourou station. Statistical analysis using the chi-square test showed that variations in the prevalence of *C. cirratus*, *C. thurstonae*, *C. sclerosus*, *C. tiberianus*, *C. halli* and *C. tilapiae* were not statistically significant between two stations ($p > 0.05$). However, significant differences were observed for *C. rognoni* and *S. longicornis* ($p < 0.05$). At Ahondo station, the mean parasite intensities were 19.28 ± 0.9 for *C. cirratus*, 28.78 ± 1.4 for *C. thurstonae*, 30.01 ±1.2 for *C. sclerosus*, 19.19 ±0.7 for *C. tiberianus*, 27.79 ± 2.1 for *C. halli* and 30.40 ±1.3 for *C. tilapiae*. At Courandjourou station, the highest intensities were recorded for *C. rognoni* (10.86±1.6) and *S. longicornis* (16.83±1.2). In terms of abundance, the highest values at Ahondo station were observed for *C. cirratus* (6.83), *C. thurstonae* (20.49), *C. sclerosus* (20.60), *C. tiberianus* (17.66), *C. halli* (18.55), and *C. tilapiae*, while at Courandjourou station, *C. rognoni* and *S. longicornis* showed respective abundances of 3.60 and 9.62. The Mann-Whitney test applied to intensities and abundances showed that fish from Ahondo station were significantly most infected than those from Courandjourou station ($p < 0.05$).

Within the parasitic community recovered from the gills of *Orechromis niloticus*, the dominant species at Ahondo station defined by a prevalence greater than 50% were *Cichlidogyrus thurstonae, C. sclerosus, C. tilapiae* and *C. halli*. The species *C. rognoni* (35.08%), *C. cirratus* (35.42%) and *C. tiberianus* (35.56%) were considered intermediate. In contrast, at the Courandjourou station, only *Scutogyrus longicornis*, with a prevalence of 57.12%, was classified as dominant.

Table 1 : Spatial variation of Prevalence (P), Mean Intensity (MI) and Abondance (A) of Monogenean parasites of *Oreochromis niloticus*

Stations	Monogeneans	Fish examined	Infested fish	P (%)	MI	A
Ahondo	*C. rognoni*	590	207	35.08	1.84±1.2	0.65
	C. cirratus	590	209	35.42	19.28±0.9	6.83
	C. thurstonae	590	420	71.19	28.78±1.4	20.49
	C. sclerosus	590	405	68.64	30.01±1.2	20.60
	C. tiberianus	590	210	35.59	19.19±0.7	6.83
	C. halli	590	375	63.56	27.79±2.1	17.66
	C. tilapiae	590	360	61.02	30.40±1.3	18.55
	S. longicornus	590	27	4.58	3.89±0.2	0.18
Courandjourou	*C. rognoni*	590	198	33.55	10.86±1.6	3.64
	C. cirratus	590	32	5.42	2.90±0.4	0.15
	C. thurstonae	590	420	71.18	15.70±1.1	11.18
	C. sclerosus	590	408	69.15	14.56±0.8	10.07
	C. tiberianus	590	192	32.54	10.86±1.3	3.53
	C. halli	590	357	60.51	17.64±1.4	10.68
	C. tilapiae	590	333	56.44	15.99±0.9	9.02
	S. longicornus	590	341	57.79	16.83±1.2	9.73

C : *Cichlidogyrus* ; S : *Scutogyrus*

Temporal variations of epidemiological indices of gill Monogeneans in *Oreochromis niloticus:* The average monthly variations in the epidemiological indices of the eight Monogenean species parasitizing *Oreochromis niloticus* at the Ahondo station are presented in Figure 2. Analysis of these data revealed that the highest prevalence values were recorded in June for *Cichlidogyrus rognoni* (50%), *C. cirratus* (50%), *C. thurstonae* (100%), *C. sclerosus* (95.83%), *C. tiberianus* (45.83%) and *C. halli* (87.5%). In contrast, *C. tilapiae* (91.49%) and *Scutogyrus longicornis* (8.5%) reached their maximum prevalence in October, corresponding to the long and small rainy seasons, respectively. The lowest prevalence rates were observed in February for *C. rognoni* (13.63%), *C. cirratus*

(18.18%), *C. thurstonae* (48.94%), and *C. tilapiae* (35.29%) and in January for *C. sclerosus* (45.45%) and *S. longicornis* (1.96%), coinciding with the long dry season. Chi-square tests indicated significant differences in prevalence across seasons for all analyzed species (*C. rognoni, C. cirratus, C. thurstonae, C. sclerosus, C. tiberianus, C. halli, C. tilapiae* and *S. longicornis*) ($p < 0.05$). Regarding mean parasite intensities, high values were recorded in October for *C. rognoni* (24.60) and *C. cirratus* (27.36) and in June for *C. thurstonae* (52.0), *C. sclerosus* (55.72), *C. tiberianus* (29.14), *C. halli* (46.00), *C. tilapiae* (45.18) and *S. longicornis* (5.75). The lowest intensities were observed in January for *C. rognoni* (6.25), *C. cirratus* (5.1), *C. thurstonae* (8.32), *C. tilapiae* (12.08) and *S. longicornis* (1) and in February for *C. sclerosus* (8.6) and *C. tiberianus* (4.25). The abundance trends generally mirrored those of the mean intensities (Figure 2). Maximum abundance values were recorded for *C. rognoni* (9.48) and *S. longicornis* (0.54) in May ; for *C. cirratus* (49.1), *C. thurstonae* (52.0), *C. sclerosus* (53.39) and *C. tiberianus* (13.35) in June and *for C. tilapiae* (40.51) in October, all corresponding to the rainy seasons. The minimum abundance values of *Cichlidogyrus* species were observed during February for *C. rognoni* (1.3*), C. cirratus* (1.08) and *C. sclerosus* (1.08) in January for *C. thurstonae* (4.07), *C. halli* (4.3) and *C. tilapiae* (2.0) and in August for *S. longicornis* (0.02) during the dry seasons. In general, parasite intensity and abundance reached their highest mean levels during the rainy periods. Mann-Whitney (U) tests applied to intensities and abundances confirmed significant seasonal differences in gill Monogenean infestation of *O. niloticus* ($p < 0.05$). The Figure 3 illustrates the seasonal variation of parasitic indices for the eight Monogenean species collected from the gills of *O. niloticus* at the Courandjourou station in the Taabo man-made lake. Maximum prevalences were recorded in June for *C. thurstonae* (90.00%), *C. sclerosus* (96.00%) and *C. tiberianus* (52.00%) and in October for *C. rognoni* (46.15%), *C. cirratus* (9.62%), *C. halli* (78.85%), *C. tilapiae* (75.00%) and *S. longicornis* (76.92%), corresponding respectively to the long and small rainy seasons. The lowest prevalences were observed for *C. cirratus* (2.04%) and *C. tiberianus* (16.32%) in January, *C. rognoni* (15.21%) in February, *C. thurstonae* (52.94%) and *C. sclerosus* (48.98%) in November, *C. halli* (42.86%) and *S. longicornis* (40.82%) in December and *C. tilapiae* (36.54%) in August periods corresponding to the long (November–February) and small (July–August) dry seasons. Chi-square tests applied to prevalence data confirmed that observed differences across months and seasons were statistically significant ($p < 0.05$). Regarding mean intensity (Figure 3), the highest values were recorded in June for *C. rognoni* (16.77), *C. cirratus* (6.25), *C. thurstonae* (29.69), *C. halli* (38.94), and *S. longicornis* (39.88). Elevated values were also observed in October for *C. sclerosus* (24.15), *C. tilapiae* (23.70) and *C. tiberianus* (18.72), in correspondence with rainy seasons. The lowest intensities were recorded in February for *C. thurstonae* (7.76) and *C. tiberianus* (6.33) ; in August for *C. cirratus* (1.5), *C. tilapiae* (4.5) and *S. longicornis* (4.00) and in November for *C. rognoni* (6.21) and *C. halli* (6.51). The highest abundance values for monogenean species parasitizing *O. niloticus* were recorded in June, during the major rainy season: *C. rognoni* (6.76), *C. cirratus* (0.50), *C. thurstonae* (26.72), *C. tiberianus* (8.10), *C. sclerosus* (22.38), *C. halli* (28.04), *C. tilapiae* (26.52) and *S. longicornis* (27.12). Notably, a peak in *C. tiberianus* abundance (7.92) was also observed in October, corresponding to the small rainy season. Conversely, the lowest abundance values were recorded in February for *C. rognoni* (1.04), *C. cirratus* (0.03), and *C. tiberianus* (1.26) in January for *C. thurstonae* (3.57) and *C. sclerosus* (3.32) and in August for *C. halli* (2.17), *C. tilapiae* (1.65) and *S. longicornis* (1.61) periods corresponding to the long and small dry seasons. Mann-Whitney (U) tests applied to intensity and abundance data confirmed significant seasonal variation in the infestation of *O. niloticus* by different Monogenean species ($p < 0.05$).

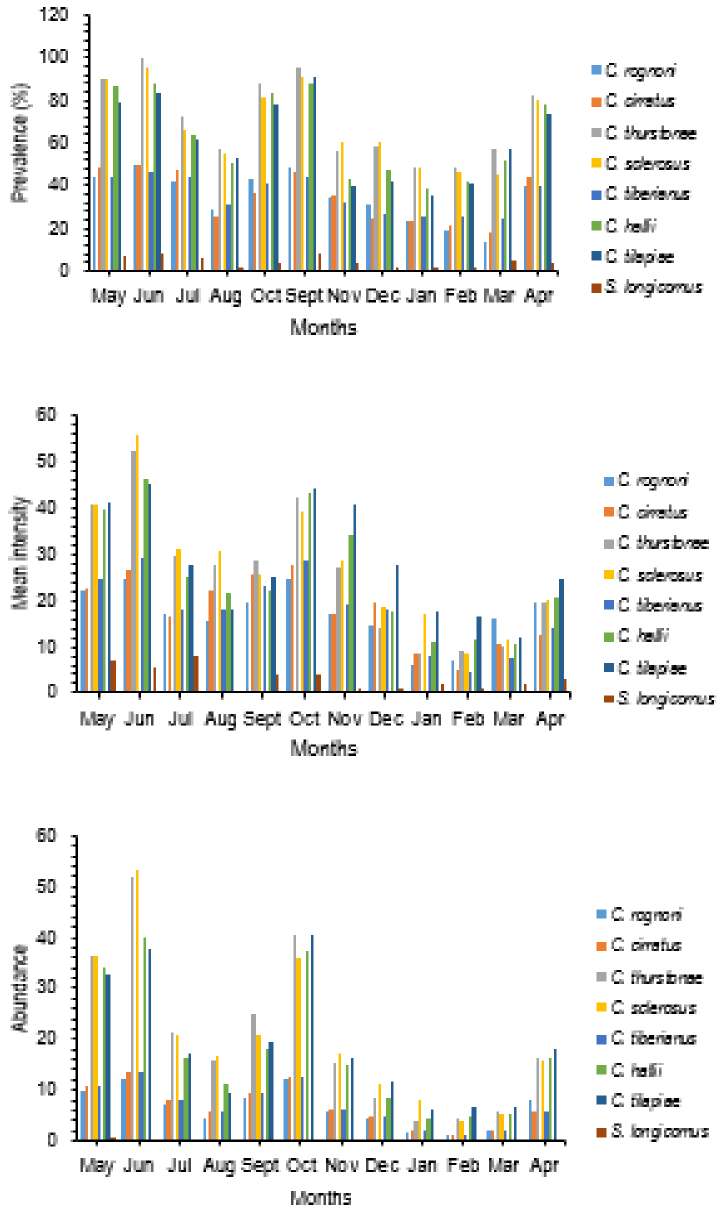

Figure 2 : Temporal variation of the Prevalence, Mean Intensity and Abundance of gill Monogenean parasites from *Oreochromis niloticus* in the Ahondo station of Taabo man made lake

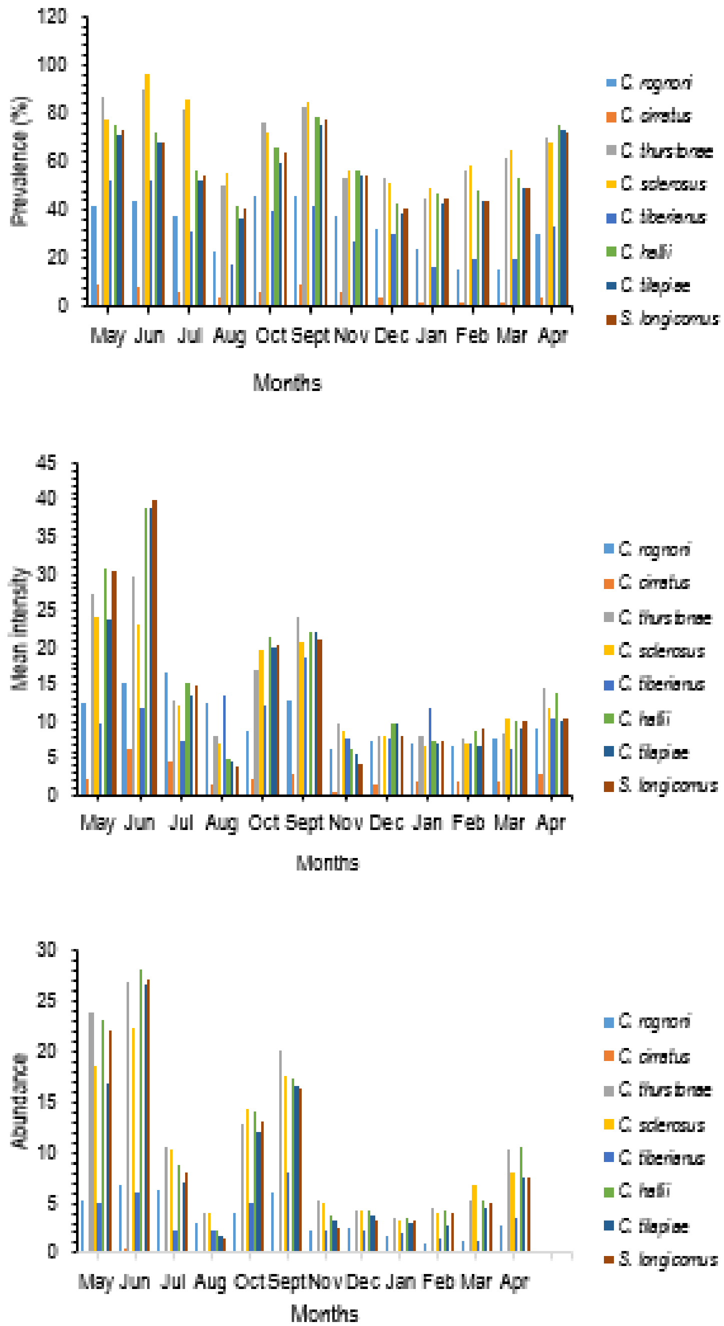

Figure 3 : Temporal variation of the Prevalence, Mean Intensity and Abundance of gill Monogean parasites from *Oreochromis niloticus* in the Courandjourou station of Taabo man made lake

Impact of parasitism on the condition factor of *Oreochromis niloticus*: Table 2 summarizes the biometric traits and health indices of *Oreochromis niloticus* in relation to their parasitic status across the Ahondo and Courandjourou sampling sites. At Ahondo station, infected fish exhibited an average length of 23.1 cm and an average weight of 44.37 g, compared to 23.5 cm and 97.33 g for uninfected fish. Their condition factor was significantly lower (0.36 ± 0.01) than that of uninfected individuals (0.75 ± 0.10), with a marked variation confirmed by the Mann–Whitney analysis ($p < 0.05$). At Courandjourou station, infected individuals had an average length of 24.3 cm and an average weight of 60.26 g, while uninfected fish reached 24.8 cm and 123.54 g. The condition factor was 0.42 ± 0.02 for infected fish and 0.81 ± 0.10 for uninfected ones. A marked variation was detected between the two groups, as evidenced by the Mann–Whitney analysis ($p < 0.05$). Finally, comparing infected fish between the two stations, a significant difference in condition factor was observed: the condition factor of infected fish from Courandjourou (0.42 ± 0.02) was higher than that of those from Ahondo station (0.36 ± 0.01), as indicated by the Mann-Whitney test ($p < 0.05$).

Table 2 : Condtion factor of infected and uninfected *Oreochromis niloticus* fish in Ahondo and Courandjourou stations in the Taabo man made lake

Stations	Hots	Average size (cm)	Average weight (g)	Condition factor
Ahondo	Examined			
	Infected	23.1	44.37	0.36±0.01
	uninfected	23.5	97.33	0.75±0.1
Courandjourou	Examined			
	Infected	24.3	60.26	0.42±0.02
	uninfected	24.8	123.54	0.81±0.1

DISCUSSION

The analysis of monogenean parasites infecting the gills of *Oreochromis niloticus* in the Taabo man-made lake revealed the presence of eight species, including seven belonging to the genus *Cichlidogyrus* and one to the genus *Scutogyrus.* This diversity was observed at two distinct sampling stations, Ahondo and Courandjourou, where identical parasite richness was recorded. Compared to previous findings by Blahoua *et al.* (2013 ; 2020), who reported five species in lake Ayamé 1 and six in the Lobo River, the current results suggest a higher diversity. This variation may be explained by ecological differences between the study environments. As highlighted by El-Seify *et al.* (2011), parasite richness is influenced by multiple factors including host biological characteristics (e.g., size, behavior, life history), sampling pressure, environmental parameters, and phylogenetic relationships. Each ecosystem presents a unique combination of abiotic and biotic conditions that may promote or inhibit the presence of specific parasite species. Therefore, the observed species composition in the Taabo man-made lake may reflect environmental conditions specific to this site, aligning with Zharikova's (2000) findings on the ecological distribution of parasites. Additionally, the similar species richness between Ahondo and Courandjourou stations suggests that the Monogenean species identified possess broad ecological tolerances, enabling them to colonize various zones of the lake. This homogeneity may reflect a generalized adaptation to the environmental conditions of this man-made lake, suggesting a degree of ecological plasticity or cosmopolitanism among these Monogeneans. The results also showed that *O. niloticus* exhibited higher infestation levels at Ahondo station than those recorded at Courandjourou station.This disparity is supported by higher prevalence, intensity and abundance values for most *Cichlidogyrus* species at Ahondo station. These differences may be linked to specific environmental conditions at each station. Invasive aquatic vegetation dominates the open surface of Ahondo, covering nearly 80% of the area and significantly impairing ecological functions and human use. This vegetation reduces dissolved oxygen concentrations and decreases water transparency. Such physicochemical conditions can impair host physiology. Kakuta *et al*. (1992) demonstrated that low oxygen levels increase plasma cortisol and catecholamine levels markers of acute stress which may lead to immunosuppression in fish. This weakened immune response renders hosts more susceptible to parasitic infections, potentially explaining the significantly higher prevalence and intensity of infestations at Ahondo. Moreover, the low transparency may promote suspension of fine particles that could act as passive vectors for parasite eggs or infective stages, increasing encounter rates with the host. These combined factors likely enhance both survival and transmission of Monogeneans in this environment, which may account for the dominance of certain species at Ahondo station. At Courandjourou station, *S. longicornis* was the dominant species, whereas other Monogeneans exhibited relatively lower prevalence. This may reflect reduced parasitic pressure due to more favorable abiotic conditions or limited aquatic vegetation, which could restrict parasite proliferation and transmission. Seasonal dynamics also significantly influenced the infestation patterns of gill monogeneans in *O. niloticus*, with higher infection rates during the rainy seasons, particularly for *C. thurstonae*, *C. sclerosus*, *C. tilapiae, C. halli* and *S. longicornis*. These findings align with previous observations by Blahoua (2013) and Blahoua *et al.* (2009, 2018, 2020), who documented increased monogenean infestations in *O. niloticus*, *Sarotherodon melanotheron*, and *Coptodon zillii* in similar aquatic ecosystems, such as Ayamé lake and the Lobo River. Similar results were also reported by Adou (2018) in Ayamé 2 man-made lake. The elevated prevalence during rainy seasons may result from a combination of environmental and immunological factors. Seasonal changes are known to affect fish immune function. During the rainy season, elevated organic matter levels, temperature fluctuations, and increased turbidity and pollution create physiological stress, making fish more vulnerable to parasitic infections. This seasonal immunosuppression is particularly pronounced in breeding females and juveniles, which become prime hosts for infective stages. Additionally, the Taabo reservoir is located near intensively farmed areas, resulting in significant inputs of agrochemicals and domestic wastewater. Chronic contamination by these pollutants degrades water quality and compromises fish immune resilience, as noted by Kemp & Spotila (1997). This chemical pollution is therefore an aggravating factor in the observed parasitic dynamics. From an ecological perspective, the biological cycles of monogeneans are also influenced by climatic and environmental cues. As reported by Tinsley & Jackson (2002), Monogenean egg hatching is often synchronized with host hormonal and behavioral signals, particularly during reproduction, which often coincides with the rainy season. This adaptive strategy enables optimal host colonization, especially of immunologically immature individuals such as larvae and juveniles. Conversely, infestation levels decrease during dry seasons, likely due to increased mortality of adult parasites caused by higher water temperatures. This observation is consistent with findings from Bilong Bilong & Tombi (2005) and Blahoua (2013), who emphasized the direct influence of temperature on the Monogenean life cycle. High temperatures can reduce egg viability and disrupt larval development, thereby limiting infestation rates. The condition factor (K) is a widely used morphometric indicator to assess the physiological state and general well-being of fish within a given ecosystem. It reflects the balance between fish length and weight and is influenced by both biotic and abiotic factors (Oso & Iwalaye, 2016). In this study, mean condition factor values in infected fish were consistently lower than in uninfected individuals, with all values below 1. This suggests a generally poor health status, manifesting as emaciation and reduced body mass in parasitized fish. A condition factor below 1.0 is typically indicative of a thin, undernourished fish with compromised physiological condition, whereas values equal to or greater than 1 suggest good health, robust body condition, and adequate reproductive potential (Indarjo *et al.,*2021). Furthermore, the relationship between parasite abundance and fish size was found to be weak or insignificant, which could be attributed to local environmental factors influencing growth and resistance. Oso & Iwalaye (2016) and Ajibare *et al.* (2020) demonstrated that fluctuations in fish condition factors may result from variables such as age, sex, stress, maturity stage, nutritional status, feeding activity, food availability, seasonal patterns, and water quality. In the context of the Taabo man-made lake, these factors appear exacerbated by environmental degradation. Limited food availability combined with high parasite burdens restrict weight gain and hinder normal growth. This situation reflects a disrupted host-parasite balance, likely worsened by the reservoir's unfavorable physicochemical conditions (pollution, eutrophication, turbidity).

CONCLUSION AND APPLICATION OF RESULTS

This study on *Oreochromis niloticus* in the Taabo man-made lake revealed notable gill Monogenean diversity, with eight species identified. Significant spatial and seasonal variations in epidemiological indices were observed, with higher infestation levels at the Ahondo station and during the rainy seasons. These differences appear to be linked to local environmental factors, including aquatic vegetation density and water quality. Parasitism had a clear impact on the condition factor of the fish, indicating a deterioration in physiological state. Infected individuals showed marked emaciation and reduced body condition. Overall, these findings highlighted the importance of monitoring parasitic dynamics in modified aquatic systems. They support that it is important to maintain aquatic ecosystem in good quality by taking into account management approach combining pollution control, wetland protection, and continuous ecological monitoring. In addition, reducing nutrient inputs and industrial discharges, along with restoring riparian zones, could help prevent eutrophication and habitat degradation. At least, participatory governance and strict enforcement of environmental regulations could ensure the long-term sustainability of aquatic ecosystems.

ACKNOWLEDGEMENT

The authors sincerely thank the local fishermen and the entire population of Taabo for their invaluable cooperation and support during the data collection process in the study area.

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