



## Age and growth of *Oreochromis niloticus* in the Samandéni Reservoir, Burkina Faso: a scale-based study


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### Abstract

*Oreochromis niloticus* is a key species supporting inland fisheries in tropical African reservoirs, including the recently impounded Samandéni Reservoir in Burkina Faso. However, age-based information required for reliable stock assessment remains limited for this reservoir. This study estimated age structure, growth parameters, and population characteristics of *O. niloticus* using scale readings from 318 specimens collected monthly between October 2021 and September 2022 at three sampling sites: Badoville ( $n = 114$ ), Sadina ( $n = 100$ ), and Dioufoulma ( $n = 104$ ). Monthly sample sizes were relatively uniform, ranging from 25 to 28 individuals, ensuring consistent temporal coverage throughout the study period. Scale annuli were examined and validated using marginal increment analysis. The population exhibited a unimodal length-frequency distribution ranging from 10.0 to 32.0 cm (mean $\pm$ SD: 20.38 $\pm$ 0.17 cm). The sex ratio was significantly male-biased (2.06:1,  $\chi^2 = 38.04$ ,  $p < 0.001$ ). Length–weight relationships indicated isometric growth for the pooled population ( $b = 2.96$ ), negative allometry in males ( $b = 2.92$ ), and isometric growth in females ( $b = 3.09$ ). Marginal increment analysis confirmed annual annulus formation, with minimum values occurring in February during the dry season. The von Bertalanffy growth model showed rapid juvenile growth followed by a progressive decline after maturation. Age classes ranged from 0+ to VI+, with dominance of intermediate age groups (II+ to IV+), suggesting continuous recruitment and moderate exploitation pressure. These results provide the first validated scale-based age and growth parameters for *O. niloticus* in the Samandéni Reservoir and contribute essential baseline information for sustainable fisheries management.

**Keywords:** age determination; growth; *Oreochromis niloticus*; Samandéni Reservoir; scales; von Bertalanffy

### 1 | INTRODUCTION

Reservoirs play a vital role in tropical inland fisheries, contributing significantly to food security, rural livelihoods, and economic development in many low-income countries (Youn *et al.* 2014). In Burkina Faso, the Samandéni

Reservoir, located in the southwest, is among the largest recently constructed reservoirs in the country and currently supports a rapidly developing fishery under increasing pressure from exploitation. Among the fish species present, Nile tilapia (*Oreochromis niloticus* Linnaeus,

1758) is one of the dominant and most economically important species, contributing significantly to landings and household income (Minoungou *et al.* 2020).

*Oreochromis niloticus* is widely distributed across Africa and heavily exploited in many fisheries due to its rapid growth, high reproductive output, and strong environmental tolerance (Munguti *et al.* 2022; Ali *et al.* 2025). In Burkina Faso, reliable biological information on age, growth, and population dynamics is essential for stock assessment and sustainable fisheries management. Age is a central parameter in fish population studies, forming the basis for estimating growth, mortality, recruitment, and production (Hoggarth 2006). Errors in age estimation can therefore lead to biased assessments and inappropriate management decisions.

Fish age can be determined using calcified structures such as otoliths and scales (Campana 2001; Panfili *et al.* 2002; Abouelfadl *et al.* 2020). Although otoliths generally provide the most accurate age estimates, scale analysis remains widely applied in tropical and data-limited fisheries because of its non-lethal nature, low cost, and operational simplicity (Abouelfadl *et al.* 2020). Scale-based ageing has been successfully applied to *O. niloticus* in several African and tropical ecosystems, providing useful information on growth dynamics and life-history traits (Abouelfadl *et al.* 2020; Mishra and Dwivedi 2021). Growth patterns in *O. niloticus* vary considerably among populations and are influenced by environmental conditions, reservoir productivity, hydrological regimes, and fishing pressure (Ojuok *et al.* 2007).

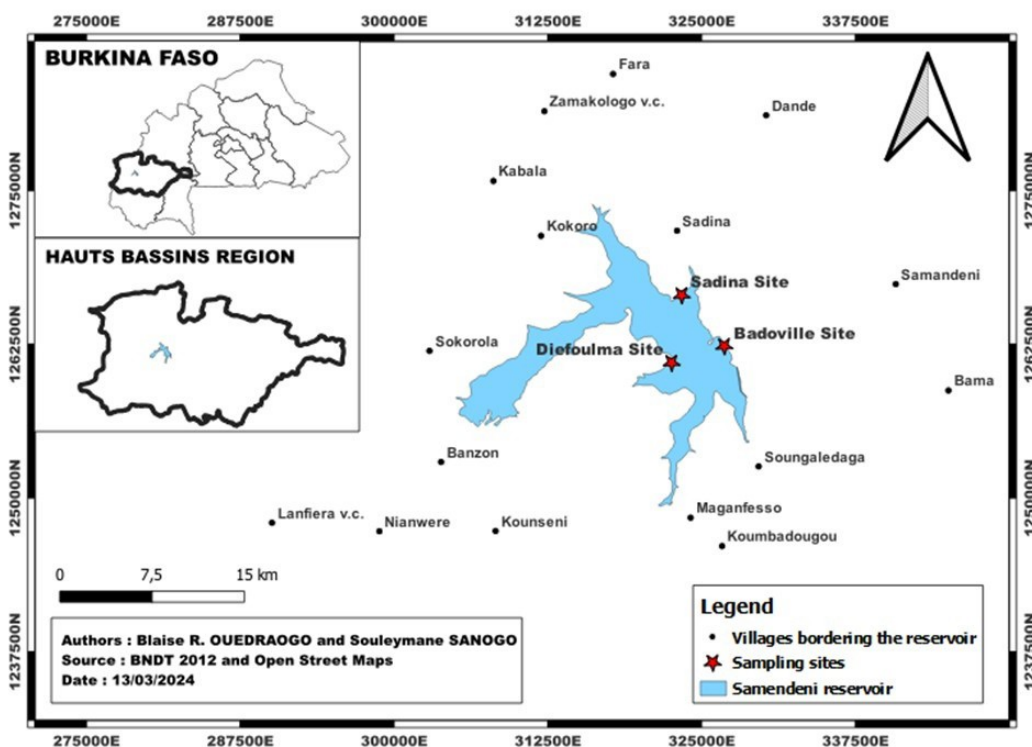
Despite the ecological and socio-economic importance of *O. niloticus* in the Samandéni Reservoir, studies on age and growth based on scale analysis remain limited. Most previous research in Burkina Faso has focused on length–weight relationships, reproduction, condition factors, and exploitation parameters (Minoungou *et al.* 2020; Da *et al.* 2024). Ouédraogo *et al.* (2025) estimated growth and exploitation parameters using length–frequency data, but such approaches do not rely on direct age validation from calcified structures such as scales or otoliths, which may reduce the precision of growth and mortality estimates (Campana 2001a).

The present study aims to estimate the age structure and growth parameters of *O. niloticus* in the Samandéni Reservoir using scale readings, with particular emphasis on seasonal growth patterns and annulus formation. The results are expected to provide baseline information to support sustainable fisheries management and stock assessment in the reservoir.

## 2 | METHODOLOGY

### 2.1 Study area

The Samandéni Reservoir is located in the West Sudanian savanna of Burkina Faso, within the Hauts-Bassins Region, and was constructed along the Mouhoun River (Figure 1). It lies between 11°19'–11°23'N and 4°34'–4°46'W. As the third-largest reservoir in the country, it covers an area of approximately 68,202 hectares.



**FIGURE 1** Map of Samandéni Reservoir in Burkina Faso indicating sampling areas.

The region is characterized by a tropical savanna climate, with mean annual temperatures ranging from 23.5°C to 31.3°C (Kabré *et al.* 2024). Rainfall follows a marked seasonal pattern, with an average annual precipitation of about 1,076 mm recorded between 2010 and 2020 (Kabré *et al.* 2024). The hydrological regime is defined by a long dry season from October to May and a shorter rainy season from June to September. Since October 2020, the reservoir has been designated as a Ramsar site (No. 2439).

## 2.2 Data collection

*Oreochromis niloticus* specimens were sampled monthly from October 2021 to September 2022 at three sampling sites: Dioufoulma, Badoville, and Sadina within the Samandéni Reservoir, resulting in 12 sampling events per site. Fish were obtained from the commercial catches of local artisanal fishermen using gill nets and trammel nets with mesh sizes of 20, 30, 45, and 60 mm. These nets were generally set between 4:00 and 5:00 p.m. and retrieved the following morning between 07:00 and 10:00 a.m., corresponding to a typical soak time of approximately 14–18 hours as practiced by local fishermen. Because specimens were obtained from commercial artisanal fisheries, the number of nets and fishing operations was not controlled by the authors. However, fish were sampled monthly using the same sampling protocol throughout the study period. Monthly sample sizes ranged from 25 to 28 individuals, ensuring consistent temporal coverage across the study period. A total of 318 *O. niloticus* specimens were collected, including 114 from Badoville, 100 from Sadina, and 104 from Dioufoulma. The entire sample was used for age and growth analyses. Species identification was performed using the taxonomic keys of Paugy *et al.* (2003). After collection, fish were preserved on ice and transported to the Fisheries and Wildlife Research and Training Laboratory of Nazi BONI University for further processing.

## 2.3 Length frequency distribution, sex ratio, and biological analyses

In the laboratory, all specimens were measured individually. Total length (*TL*) was recorded to the nearest millimeter using a calibrated ichthyometer, as the distance from the anterior tip of the snout to the posterior edge of the caudal fin. Total weight was measured to the nearest 0.1 g using an electronic balance.

Size structure was described using 1 cm class intervals based on length–frequency distributions. Sex ratio was calculated as the proportion of males to females and tested against the expected 1:1 distribution using a chi-square goodness-of-fit test (Sokal and Rohlf 1987).

The length–weight relationship was expressed using the equation:  $W = a \times TL^b$  (Ricker 1975), where *W* is the

total weight (g) and *TL* the total length (cm). Analyses were performed separately for males, females, and the pooled data. Deviation of the slope from the isometric value ( $b = 3$ ) was tested using Student's *t*-test with *t* value  $t_s = (b - 3) / SE$ , where SE is the standard error of *b* (Sokal and Rohlf 1987). Growth was considered isometric when *b* did not differ significantly from 3 and allometric when significant deviations occurred ( $p < 0.05$ ), classified as negative ( $b < 3$ ) or positive ( $b > 3$ ) (Ricker 1975).

## 2.4 Age determination and marginal increment analysis

Six to eight scales were collected from each specimen below the pectoral fin and above the lateral line on the left side of the body, following Abecasis *et al.* (2008). Only non-regenerated scales with clearly visible circuli were selected for analysis. Scales were cleaned using a 5% aqueous ammonia solution, rinsed with distilled water, air-dried, and mounted between glass slides. Scales observations were performed under constant magnification using a slide projector equipped with a micrometer scale for calibration.

Age was determined independently by two experienced readers without prior knowledge of fish size, weight, or capture date. In the event of disagreement, a third reading was conducted jointly by the two readers to reach a consensus. Annuli were identified as opaque bands characterized by closely spaced circuli, marking the transition between fast and slow growth periods.

The marginal increment ratio (MIR) was calculated as:  $MIR = (R - R_n) / (R_n - R_{n-1})$ , where *R* is the total scale radius, *R<sub>n</sub>* is the last completed annulus, and *R<sub>n-1</sub>* is the previous one (Lessa *et al.* 2006; Millot *et al.* 2024). The monthly sample sizes used for the marginal increment ratio (MIR) analysis were as follows: October ( $n = 26$ ), November ( $n = 28$ ), December ( $n = 26$ ), January ( $n = 27$ ), February ( $n = 25$ ), March ( $n = 26$ ), April ( $n = 27$ ), May ( $n = 27$ ), June ( $n = 27$ ), July ( $n = 25$ ), August ( $n = 27$ ), and September ( $n = 27$ ). These relatively uniform sample sizes ensured consistent temporal representation for the MIR analysis. Measurements were obtained using ImageJ software from the focus to each annulus edge. Monthly MIR means were calculated and plotted to determine the periodicity of annulus formation (Lessa *et al.* 2006).

## 2.5 Growth pattern

The von Bertalanffy growth function (VBGF) was fitted to length-at-age data following von Bertalanffy (1938):  $L_t = L_\infty [1 - \exp(-K(t - t_0))]$ , where *L<sub>t</sub>* is the length at age *t*, *L<sub>∞</sub>* is the asymptotic length, *K* is the growth coefficient, *t* is the age, and *t<sub>0</sub>* is the theoretical age at zero length.

Parameters were estimated using non-linear fitting based on mean length-at-age values. The growth performance index ( $\phi'$ ) was calculated following (Munro and Pauly 1983):  $\phi' = \log_{10}(K) + 2 \times \log_{10}(L_\infty)$ .

### 3 | RESULTS

#### 3.1 Population structure, length–weight relationship, and condition factor

A total of 318 specimens of *O. niloticus* were collected from the Samandéni Reservoir, including 106 females (33.33%) and 212 males (66.67%). Monthly sample sizes showed limited variation, ranging from 25 to 28 individuals, indicating a relatively uniform sampling effort across the study period (Table 1).

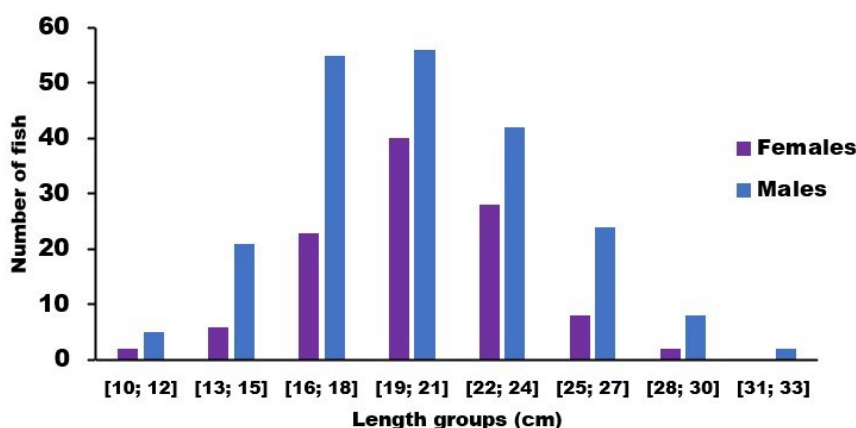
Total length (*TL*) ranged from 10.0 to 32.0 cm, with a mean of 20.38±0.17 cm, while total weight ranged from 26.0 to 817.4 g, with a mean of 183.14±6.30 g. Males showed *TL* values from 10.0 to 30.0 cm and weights from 26.0 to 817.4 g, whereas females ranged from 10.0 to

31.0 cm and from 31.0 to 816.9 g. Mean *TL* was 20.38±0.33 cm for females and 20.37±0.28 cm for males, with no significant difference between sexes (*t*-test: *t* = 0.019, *df* = 252.523, *p* > 0.05). Similarly, total weight showed no significant difference between females (184.02±10.62 g) and males (182.65±7.84 g) (*t*-test: *t* = 0.103, *df* = 316, *p* > 0.05).

The length–frequency distribution was unimodal (Figure 2), although the wide size range indicates the presence of several size groups within the population. The sex ratio was significantly male-biased (2.06:1), differing from the expected 1:1 ratio ( $\chi^2 = 38.04$ , *p* < 0.001). This pattern was observed across all size classes.

**TABLE 1** Monthly distribution of *Oreochromis niloticus* sampled from October 2021 to September 2022 in the Samandéni Reservoir.

Sites	2021			2022									Total
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
Badoville	9	11	9	10	8	9	11	10	9	8	10	10	114
Sadina	9	8	8	8	8	9	8	9	9	8	8	8	100
Dioufoulma	8	9	9	9	9	8	8	8	9	9	9	9	104
Total	26	28	26	27	25	26	27	27	27	25	27	27	318



**FIGURE 2** Length frequency of *Oreochromis niloticus* from Samandéni Reservoir, Burkina Faso.

The length–weight relationship for pooled data was described by:  $W = 0.0216 \times TL^{2.9609}$ . The estimated exponent (*b* = 2.9606±0.029) did not differ significantly from 3 (*t*-test: *t* = -1.35, *df* = 316, *p* > 0.05), indicating isometric growth (Figure 3a). Sex-specific analysis showed contrasting patterns. Males followed the equation:  $W = 0.0247 \times TL^{2.917}$  with  $R^2 = 0.9686$ . The estimated *b* value (*b* = 2.917) was significantly lower than 3 (*t*-test: *t* = -2.441, *df* = 210, *p* < 0.05), indicating negative allometric growth (Figure 3b). However, females followed the equation:  $W = 0.0146 \times TL^{3.0912}$  with  $R^2 = 0.9732$ . The allometric coefficient (*b* = 3.0912) did not differ significantly from the theoretical value of 3 (*t*-test: *t* = 1.59, *df* = 104, *p* > 0.05), showing isometric growth (Figure 3c).

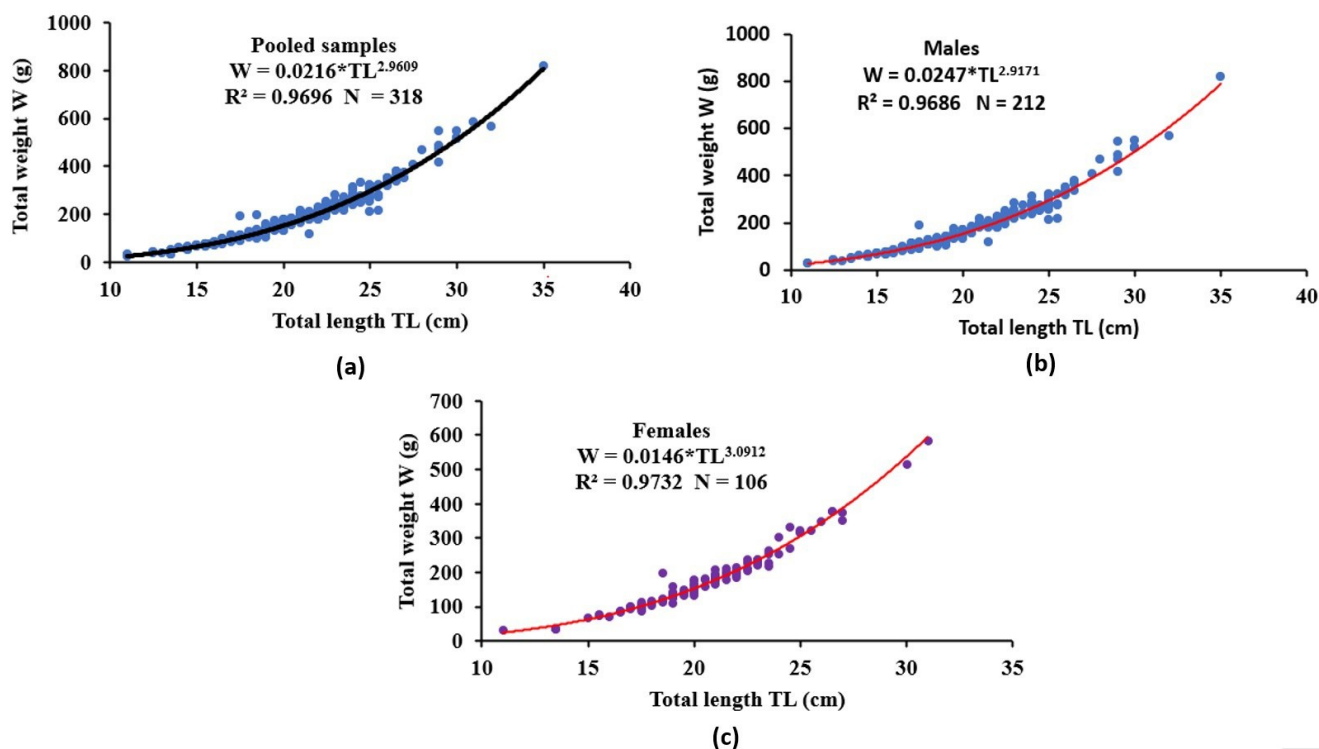
#### 3.2 Annulus formation, marginal increment, and age structure of the population

A significant relationship between total length and scale radius ( $r^2 = 0.806$ ) was observed (Figure 4). Scale examination revealed distinct annuli suitable for age determination (Figure 5). Marginal increment analysis showed seasonal variation, with minimum values recorded in February (Figure 6).

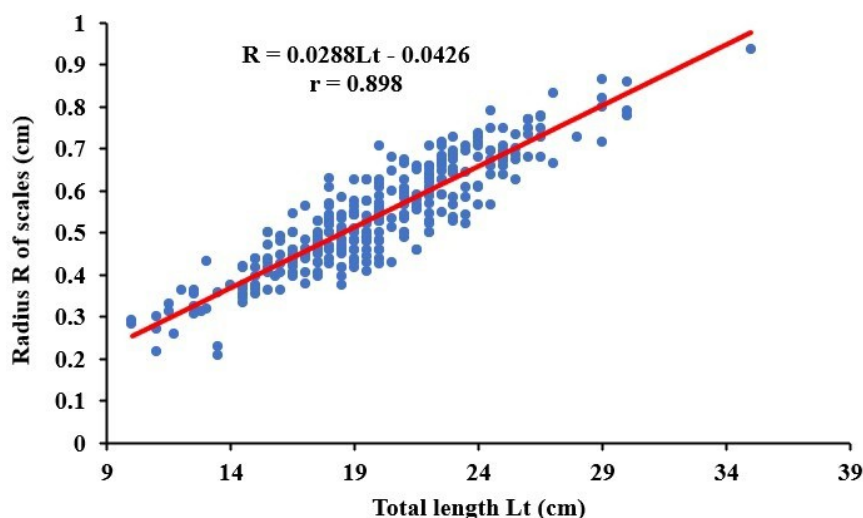
Age structure analysis revealed seven age classes (0+ to VI+) (Table 2; Figure 7). Intermediate age groups (II+ to IV+) dominated, representing more than 63% of the sampled population. Age class IV+ was the most abundant (23.58%), followed by class III+ (22.01%). The youngest (0+) and oldest (VI+) classes each represented 6.29% of

the total sample. Sex-specific analysis showed a predomi-

nance of males across all age classes.



**FIGURE 3** Length–weight relationship of *Oreochromis niloticus*, based on specimens collected from Samandéni Reservoir, Burkina Faso; pooled samples (a), males (b), and females (c).



**FIGURE 4** Relationship between total body length and scale radius of *Oreochromis niloticus* from Samandéni Reservoir, Burkina Faso.

### 3.3 Growth pattern

The von Bertalanffy growth model describing the growth of *O. niloticus* was:

$$L_t = 30.08 \times (1 - e^{-0.45(t + 0.02)})$$

(Table 2 and Figure 8). The growth performance index was  $\phi' = 2.61$ .

## 4 | DISCUSSION

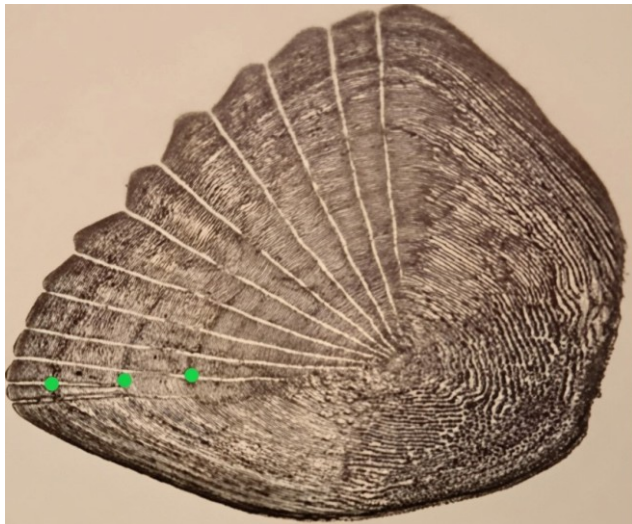
### 4.1 Population structure and sex ratio

The unimodal length–frequency distribution observed in this study suggests the dominance of a principal cohort within the fishery. However, the broad size range indi-

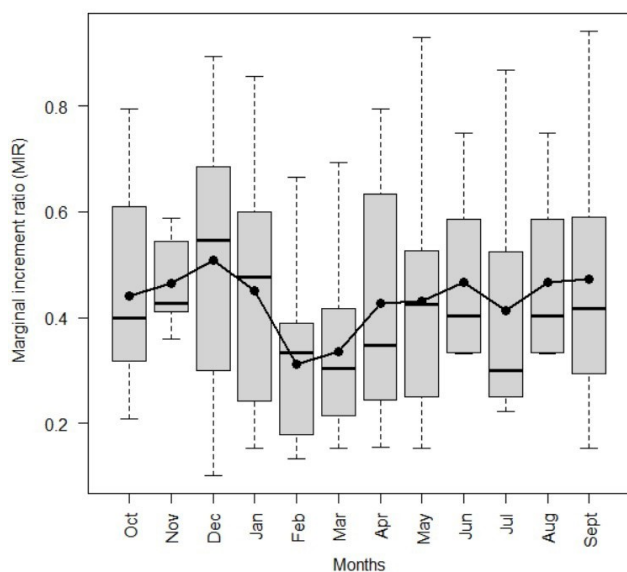
cates the presence of multiple age groups and reflects continuous recruitment within the population.

The sex ratio was significantly skewed toward males. Similar male dominance has been reported in several African aquatic systems, including Lake Victoria in Kenya (Njiru *et al.* 2006), Cross River in Nigeria (Offem *et al.* 2007), and Lake Hayq in Ethiopia (Tessema *et al.* 2019). In contrast, more balanced or female-dominated populations have been described in other systems such as Wadi Hanifah in Saudi Arabia (Mortuza and Al-Misned 2013) and Tekeze Reservoir (Teame *et al.* 2018). These varia-

tions are generally associated with behavioral and ecological factors. Male tilapias are more territorial and active, increasing their vulnerability to fishing gears, whereas females often remain in sheltered habitats during incubation periods (Njiru *et al.* 2006; Otieno *et al.* 2014). Temperature-dependent sex differentiation has also been suggested in tilapia species, where elevated temperatures during early development may influence sex determination pathways (Sissao *et al.* 2019; Fagbemi *et al.* 2023).



**FIGURE 5** Representative scale of *Oreochromis niloticus* showing three distinct annuli (green arrows). The photograph was taken by the authors using a digital camera during scale reading in the laboratory. The image was processed and annotated using ImageJ software.



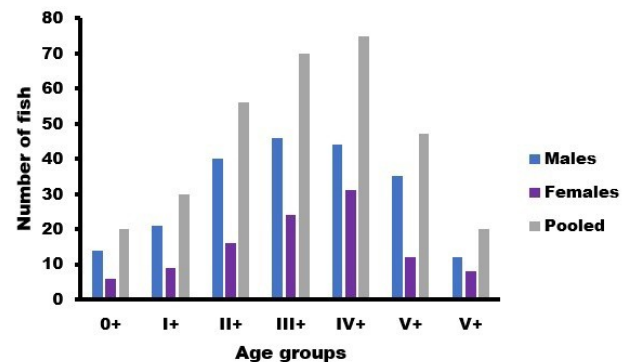
**FIGURE 6** Monthly variation of marginal increment ratio.

#### 4.2 Length–weight relationship

The estimated length–weight relationship exponent for

pooled samples indicated isometric growth. The estimated b-value falls within the expected biological range of 2.5–3.5 reported for most fish species (Froese 2006; Costa Novaes and Carvalho 2012), supporting the reliability of the model.

Sex-specific analyses revealed negative allometric growth in males and isometric growth in females, suggesting differences in energy allocation between sexes that may be associated with reproductive activity. Similar variability in growth patterns has been reported in Burkina Faso and other African aquatic systems. Minoungou *et al.* (2020) reported negative allometric growth before reservoir exploitation, whereas Ouédraogo *et al.* (2021) observed isometric growth in Mare aux Hippopotames. Positive allometric growth was also reported in Lake Shala, Ethiopia (Wagaw *et al.* 2022), while negative allometric growth has been described in Nigerian water bodies (Olagbemide and Owolabi 2023; Ubong *et al.* 2023). Such variability is generally linked to environmental conditions, including food availability, habitat productivity, reproductive investment, fishing pressure, turbidity, and population density. The relatively productive conditions of the Samandéni Reservoir, characterized by important phytoplankton development (Kabré *et al.* 2024), may contribute to favorable growth conditions.



**FIGURE 7** Age composition of *Oreochromis niloticus* from Samandéni Reservoir based on scale readings.

#### 4.3 Annulus formation and age structure

The strong relationship observed between fish length and scale radius confirms proportional growth between scales and somatic growth, supporting the use of scales for age estimation. Similar relationships have been reported for tilapia populations in other tropical systems (Gómez-Márquez 1998; Abouelfadl *et al.* 2020).

The marginal increment analysis revealed a clear seasonal growth pattern, with minimum values recorded during the dry season. Reduced growth during unfavorable environmental periods is commonly reported in tropical freshwater fishes and is often associated with reduced food availability and environmental stress (Campana

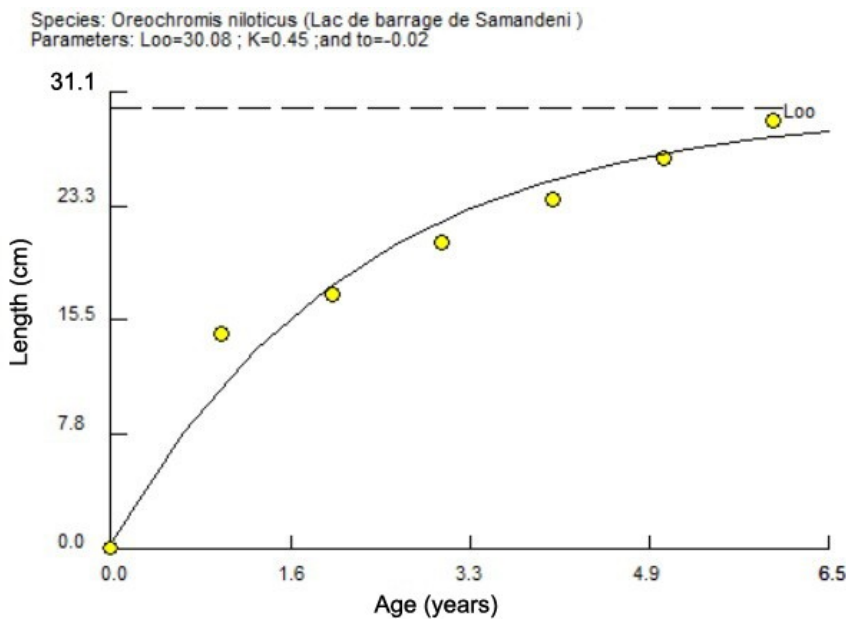
2001; Panfili *et al.* 2002).

The dominance of intermediate age classes suggests a relatively stable population structure and continuous recruitment. The low abundance of older individuals may

reflect natural mortality and fishing pressure. Similar age structures have been reported for *O. niloticus* populations in several African freshwater systems (Admassu and Caselman 2000; Tesfaye *et al.* 2021).

**TABLE 2** Mean  $\pm$  standard error of total body weight, total length, scale radius, and frequency (%) of *Oreochromis niloticus* assigned to each age group based on scale readings.

Age	Effective	Frequency (%)	Mean total weight (g)	Mean total length (cm)	Mean radius (cm)
0	20	6.29	34.5 $\pm$ 5.92	10.75 $\pm$ 0.25	0.295 $\pm$ 0.002
I <sup>+</sup>	30	9.434	50.553 $\pm$ 3.66	14.67 $\pm$ 0.241	0.368 $\pm$ 0.021
II <sup>+</sup>	56	17.61	100.472 $\pm$ 3.32	17.289 $\pm$ 0.147	0.463 $\pm$ 0.008
III <sup>+</sup>	70	22.012	173.246 $\pm$ 4.98	20.875 $\pm$ 0.169	0.63 $\pm$ 0.013
IV <sup>+</sup>	75	23.584	261.662 $\pm$ 8.66	23.781 $\pm$ 0.209	0.72 $\pm$ 0.019
V <sup>+</sup>	47	14.78	333.66 $\pm$ 14.65	26.6 $\pm$ 0.291	0.788 $\pm$ 0.021
VI <sup>+</sup>	20	6.29	448.085 $\pm$ 16.31	29.14 $\pm$ 0.261	0.83 $\pm$ 0.032



**FIGURE 8** Von Bertalanffy growth curve fitted to observed mean length-at-age data for *Oreochromis niloticus* in Samandéni Reservoir.

#### 4.4 Growth pattern

The von Bertalanffy growth parameters estimated in this study ( $L_{\infty} = 30.08$  cm,  $K = 0.45$  year<sup>-1</sup>,  $t_0 = -0.02$ ,  $\phi' = 2.61$ ) indicate relatively rapid growth during the early life stages followed by a progressive reduction after sexual maturity, which is characteristic of tilapia species (Booth and Meron 1996). These values are consistent with those previously reported for the same reservoir using length-frequency analysis ( $L_{\infty} = 33.6$  cm,  $K = 0.44$  year<sup>-1</sup>) (Ouédraogo *et al.* 2025). Rapid juvenile growth may represent an adaptive strategy to reduce predation risk (Hecht 1980).

The asymptotic length estimated in this study was higher than that reported by Minoungou *et al.* (2021) for the same reservoir, but lower than the value reported by Ouédraogo *et al.* (2025). Comparatively larger asymptotic lengths have been reported in Lake Chamo and Lake Koka

in Ethiopia (Tefaye and Wolff 2015; Tesfaye *et al.* 2021), as well as in Lake Toho in Benin (Montcho *et al.* 2015). Differences in growth parameters between ecosystems may reflect variations in productivity, environmental conditions, fishing pressure, and sampling methods (Amponsah *et al.* 2016; Panda *et al.* 2018).

#### 4.6 Limitations of the study

Although the present study provides useful baseline information, some limitations should be considered when interpreting the results. Scale-based age estimation, although widely used in tropical fisheries, may be less precise than otolith-based methods, particularly for older age classes where annuli may become less distinct. In addition, the study covered a one-year sampling period, which may not fully capture inter-annual variability in growth and recruitment patterns. Finally, potential gear selectivi-

ty effects from gill and trammel nets may have influenced the observed size and age structure of the population.

#### 4.7 Management implications

The predominance of intermediate age classes and the continuous recruitment pattern describe the population structure observed during the study period. However, because the study covered only one year, no conclusion can be made regarding the long-term stability of the population. Nevertheless, increasing fishing activity could progressively affect the stock if appropriate management measures are not implemented.

The observed size at capture included individuals smaller than the reported size at first maturity of *O. niloticus* in the Samandéni Reservoir, reported 19.0 cm for females and 21.79 cm for males (Ouédraogo *et al.* 2025). Specifically, 34.90% of the sampled individuals measured less than 19.0 cm *TL*. This suggests that a proportion of the catch may be harvested before reaching sexual maturity, which could reduce reproductive output and increase the risk of recruitment overfishing if such fishing pressure persists. To improve the sustainability of the fishery, several management actions should be considered. Increasing the minimum mesh size of fishing nets would allow individuals to reproduce before capture. Seasonal fishing restrictions during the main breeding period, likely associated with the rainy season, could also help protect spawning fish and support recruitment. In addition, regular monitoring of stock status and fishing pressure would be important for adapting management strategies over time. Combined with awareness programs for fishers and effective regulation enforcement, these measures could contribute to maintaining fish productivity and strengthening food security for local communities dependent on the reservoir fishery.

#### 5 | CONCLUSIONS

This study shows that *O. niloticus* in the Samandéni Reservoir is composed of several age cohorts, with rapid early growth and limited sexual dimorphism, suggesting a well-established population with continuous recruitment. The male-biased sex ratio likely reflects behavioural differences and differential vulnerability to fishing gears between sexes.

The length–weight relationships indicate isometric growth for the pooled population, although males exhibited negative allometry, possibly related to reproductive and energetic demands. Scale analysis confirmed annual annulus formation, supporting the reliability of age estimation. The age structure, dominated by intermediate classes, indicates a relatively stable population under moderate exploitation. Overall, these findings provide baseline information for fisheries management and highlight the importance of continued monitoring of growth, age structure, and exploitation levels to support sustaina-

ble management of the resource.

#### ACKNOWLEDGEMENTS

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#### ETHICAL APPROVAL

All applicable international, national and/or institutional guidelines for the care and use of animals were followed in this study.

#### CONFLICT OF INTEREST

The authors declare that there are no potential conflicts of interest to disclose.

#### AUTHORS' CONTRIBUTION

RBO collected the primary data, performed the data analysis, and prepared the first draft of the manuscript. SS critically reviewed the research work, assisted with data analysis, and provided technical support. IC reviewed the manuscript and provided valuable suggestions for its improvement.

#### DATA AVAILABILITY STATEMENT

The data collected during the current study will be available from the corresponding author on reasonable request.

#### REFERENCES

- Abecasis D, Bentes L, Coelho Rui, Correia C, Lino PG, ... Erzini K (2008) [Ageing seabreams: a comparative study between scales and otoliths](#). *Fisheries Research* 89(1): 37–48.
- Abouelfadl KY, Aly W, Osman AGM (2020) Ageing Nile tilapia (*Oreochromis niloticus*): A comparative study between scales and otoliths. *International Journal of Aquatic Biology* 8(4): 262–271.
- Admassu D, Casselman JM (2000) [Otolith age determination for adult tilapia, \*Oreochromis niloticus\* L. from Lake Awassa \(Ethiopian Rift Valley\) by interpreting biannuli and differentiating biannual recruitment](#). *Hydrobiologia* 418(1): 15–24.
- Ali FS, Awad ST, Ismail M, Hemeda SA, Nahas AFE, ... El-Haroun E (2025) [Selection for growth performance in \*Oreochromis niloticus\* across different aquatic environments using growth hormone gene polymorphisms](#). *Animals* 15(14): 2097.
- Amponsah SK, Ofori-Danson PK, Nunoo FK (2016) Fishing regime, growth, mortality and exploitation rates of Scomber Japonicus (Houttuyn, 1782) from catches landed along the eastern coastline of Ghana. *International Journal of Fisheries and Aquatic Research* 1(1): 5–10.
- Booth AJ, Merron GS (1996) The age and growth of the

- greenhead tilapia *Oreochromis macrochir* (Pisces: Cichlidae) from the Okavango Delta, Botswana. *Hydrobiologia* 321(1): 29–34.
- Campana SE (2001a) Accuracy, precision and quality control in age determination, including a review of the use and abuse of age validation methods. *Journal of fish biology* 59(2): 197–242.
- Costa Novaes JL, Carvalho ED (2012) Reproduction, food dynamics and exploitation level of *Oreochromis niloticus* (Perciformes: Cichlidae) from artisanal fisheries in Barra Bonita Reservoir, Brazil. *Revista de Biologia Tropical* 60(2): 721–734.
- Da N, Ouédraogo R, Minoungou M, Oueda A (2024) Growth, population parameters and stock status of *Sarotherodon galilaeus* in Samandeni Reservoir, Burkina Faso. *Open Journal of Ecology* 14(4): 257–273.
- Fagbemi MN, Oloukoule R, Lederoun D, Baglo IS, Melard C, ... Rougeot C (2023) Comparative study of the breeding performances of five populations of Nile tilapia (*Oreochromis niloticus*) (F1) in an experimental ongrowing system in Benin (West Africa). *Journal of Applied Aquaculture* 35(1): 83–99.
- Froese R (2006) Cube law, condition factor and weight-length relationships: history, meta-analysis and recommendations. *Journal of Applied Ichthyology* 22(4): 241–253.
- Gómez-Márquez JL (1998) Age and growth of *Oreochromis niloticus* (Perciformes: Cichlidae) in Mexico. *Revista de Biología Tropical* 46(4): 929–936.
- Hecht T (1980) A comparison of the otolith and scale methods of ageing, and the growth of *Sarotherodon mossambicus* (pisces: Cichlidae) in a Venda impoundment (Southern Africa). *South African Journal of Zoology* 15(4): 222–228.
- Hoggarth DD, Abeyasekera S, Arthur RI, Beddington JR, Burn RW, ... Wakeford RC (2006) Stock assessment for fishery management: a framework guide to the stock assessment tools of the fisheries management science programme. FAO Fisheries Technical, Rome, 261p.
- Kabré FA, Sanogo S, Zongo B (2024) Characteristics and dynamic of algal communities in a new impounded hydro-agricultural dam lake (Samandeni Reservoir) in Burkina Faso (Western Africa). *Journal of Water Resource and Protection* 16(11): 671–694.
- Lessa R, Santana FM, Duarte-Neto P (2006) A critical appraisal of marginal increment analysis for assessing temporal periodicity in band formation among tropical sharks. *Environmental Biology of Fishes* 77(3): 309–315.
- Millot R, Vanalderweireldt L, Sandolo LF, Durieux EDH (2024) Age estimates derived from hard parts of swordfish *Xiphias gladius* from the north-western Mediterranean Sea. *Journal of Fish Biology* 104(1): 56–68.
- Minoungou M, Ouédraogo R, Nomwine DA, Oueda A (2020) Relation longueur-poids et facteur de condition de sept espèces de poisson du réservoir de Samandeni avant son ouverture à la pêche (Burkina Faso). *Journal of Applied Biosciences* 151(1): 15559–15572.
- Minoungou M, Ouédraogo R, Oueda A (2021) Diversité piscicole et paramètres démographiques des principales espèces de poisson du réservoir de Samandeni, Burkina Faso. *Tropicicultura* 39.
- Mishra N, Dwivedi AC (2021) Age and growth of commercially exploited fish species, *Oreochromis niloticus* (Linnaeus, 1758) from the tributary of the Ganga River, India. *Poultry Fisheries & Wildlife Sciences* 9(8): 222.
- Montcho SA, Agadjihouédé H, Montchowui E, Lalèyè PA, Moreau J (2015) Population parameters of *Oreochromis niloticus* (Cichlidae) recently introduced in lake Toho (Benin, West Africa). *International Journal of Fisheries and Aquatic Studies* 2(3): 141–145.
- Mortuza MG, Al-Misned FA (2013) Length-weight relationships, condition factor and sex-ratio of Nile tilapia, *Oreochromis niloticus* in Wadi Hanifah, Riyadh, Saudi Arabia. *World Journal of Zoology* 8(1): 106–109.
- Munguti JM, Nairuti R, Iteba JO, Obiero KO, Kyule D, ... Ogello EO (2022) Nile tilapia (*Oreochromis niloticus* Linnaeus, 1758) culture in Kenya: emerging production technologies and socio-economic impacts on local livelihoods. *Aquaculture, Fish and Fisheries* 2(4): 265–276.
- Munro JL, Pauly D (1983) A simple method for comparing the growth of fishes and invertebrates. *Fishbyte* 1(1): 5–6.
- Njiru M, Ojuok JE, Okeyo-Owuor JB, Muchiri M, Mtiba MJ, Cowx IG (2006) Some biological aspects and life history strategies of Nile tilapia *Oreochromis niloticus* (L.) in Lake Victoria, Kenya. *African Journal of Ecology* 44(1): 30–37.
- Offem BO, Akegbejo-Samsons Y, Omoniyi IT (2007) Biological assessment of *Oreochromis niloticus* (Pisces: Cichlidae; Linne, 1958) in a tropical floodplain river. *African Journal of Biotechnology* 6(16): 1966–1971.
- Ojuok JE, Njiru M, Mtiba MJ, Mavuti K (2007) The effect of overfishing on the life-history strategies of Nile tilapia, *Oreochromis niloticus* (L.) in the Nyanza Gulf of Lake Victoria, Kenya. *Aquatic Ecosystem Health & Management* 10(4): 443–448.
- Olagbemide PT, Owolabi OD (2023) Length-weight relationship and condition factor of *Oreochromis niloticus* (Linnaeus, 1758) in selected tropical reservoirs of Ekiti State, southwest Nigeria. *Journal of Experimental Biology and Agricultural Sciences* 11(4): 707–719.

- Otieno ON, Kitaka N, Njiru JM (2014) Length-weight relationship, condition factor, length at first maturity and sex ratio of Nile tilapia, *Oreochromis niloticus* in Lake Naivasha, Kenya. *International Journal of Fisheries and Aquatic Studies* 2(2): 67–72.
- Ouedraogo R, Mano K, Vogna D, Sawadogo FMY (2021) [Fish assemblages and fishery analysis at the Mare aux Hippopotames in Burkina Faso](#). *Journal of Water Resources and Ocean Science* 10(6): 166–174.
- Ouédraogo RB, Sanogo S, Compaoré I (2025) [Population dynamics of Nile tilapia, \*Oreochromis niloticus\* \(Linnaeus, 1758\) in Samendéni reservoir, Burkina Faso](#). *Fisheries and Aquatic Sciences* 28(5): 285–297.
- Panda D, Mohanty SK, Pattnaik AK, Das S, Karna SK (2018) [Growth, mortality and stock status of mullets \(\*Mugilidae\*\) in Chilika Lake, India](#). *Lakes & Reservoirs: Research & Management* 23(1): 4–16.
- Panfili J, de Pontual H, Troadec H, Wright PJ (2002) Manual of fish sclerochronology. Ifremer-IRD coedition.
- Paugy D, Lévêque C, Teugels GG (2003) Faune des poissons d'eaux douces et saumâtres de l'Afrique de l'Ouest= the fresh and brackish water fishes of West Africa.
- Ricker WE (1975) Computation and interpretation of biological statistics of fish populations. *Bulletin of the Fisheries Research Board of Canada* 191: 1–382.
- Sissao R, D'Cotta H, Baroiller JF, Toguyeni A (2019) [Mismatches between the genetic and phenotypic sex in the wild Kou population of Nile tilapia \*Oreochromis niloticus\*](#). *PeerJ* 7: e7709.
- Sokal RR, Rohlf FJ (1987) Introduction to biostatistics. Freeman, New York.
- Teame T, Zebib H, Meresa T (2018) [Observations on the biology of Nile tilapia, \*Oreochromis niloticus\* L., in Tekeze Reservoir, Northern Ethiopia](#). *International Journal of Fisheries and Aquaculture* 10(7): 86–94.
- Tesfaye G, Wolff M (2015) [Stock assessment of fishery target species in Lake Koka, Ethiopia](#). *Revista de biologia Tropical* 63(3): 755–770.
- Tesfaye M, Tesfaye G, Getahun A (2021) [Growth and status of Nile tilapia \(\*Oreochromis niloticus\* L.\) stock in Lake Chamo, Ethiopia](#). *Lakes & Reservoirs Research & Management* 26(3): e12375.
- Tessema A, Getahun A, Mengistou S, Fatehi T, Dejen E (2019) Length-weight relationship, condition factor and some reproductive aspects of Nile tilapia *Oreochromis niloticus* in Lake Hayq, Ethiopia. *International Journal of Fisheries and Aquatic Studies* 7(5): 555–561.
- Ubong GN, Okon AN, Etitigwun UJ (2023) [Assessment of length-weight relationship of Nile tilapia \*Oreochromis niloticus\* \(Linnaeus 1758\) from Qua Iboe River Estuary, Southeastern, Nigeria](#). *Asian Journal of Biology* 17(2): 21–33.
- von Bertalanffy L (1938) A quantitative theory of organic growth. *Human Biology* 10: 181–213.
- Wagaw S, Mengistou S, Getahun A (2022) [Aspects of the growth and reproductive biology of \*Oreochromis niloticus\* \(Linnaeus, 1758\) in a tropical Soda Lake, Lake Shala, Ethiopia](#). *Fisheries and Aquatic Sciences* 25(7): 380–389.
- Youn SJ, Taylor WW, Lynch AJ, Cowx IG, Beard Jr TD, ... Wu F (2014) [Inland capture fishery contributions to global food security and threats to their future](#). *Global Food Security* 3(3–4): 142–148.



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