**Stock assessment of Oreochromis niloticus and Chrysichthys nigrodigitatus from the Buyo hydroelectric reservoir, bordering Taï National Park, Côte d'Ivoire**

**ABSTRACT**

The Ivorian hydrographic network includes rivers, streams, hundreds of agro-pastoral dam lakes and a lagoon system covering 1500 km2 connected to the Atlantic Ocean. Several hydroelectric reservoirs have been built on the rivers. These include the reservoirs of Ayamé 1 and 2, Kossou, Buyo, Taabo and Soubré. They represent today the biggest inland fisheries of the country. This study was conducted to provide the first data on the exploitation parameters of *Oreochromis niloticus* and *Chrysichthys nigrodigitatus* stocks in the Buyo hydroelectric reservoir bordering the Taï National Park (Côte d'Ivoire). From May 2022 to June 2023, a survey was carried out in order to identify the fishing gears used by fishermen. Some specimens of the two species have been sampled in their catches, measured in centimetres and weighed in grams individually. These data were processed using the FISAT II program. The results indicated that fishermen used five fishing gear types, with a preference for gillnets and traps. For the stocks of the two species, the growth parameters correspond to an asymptotic length L∞=4.13 cm and a growth rate K=0.39/year for *Oreochromis niloticus* and to L∞=57.23cm and K=0.230/year for *Chrysichthys nigrodigitatus*. This resulted in longevity of Tmax = 7.67 years and Tmax = 13.03 years, respectively. The mortality parameters indicated that the populations of the two species decreased more from natural causes than fishing, and their stocks were underexploited (E=0.20 for *Oreochromis niloticus* and E=0.02 for *Chrysichthys nigrodigitatus*). This is confirmed by the current exploitation rates below the exploitation rates that reduce unexploited biomass by half (E50), the economic exploitation rates (E10) and the exploitation rates that maximise the yield per recruit (Emax). The study of the probabilities of capture indicated that half of the specimens were caught just after reaching sexual maturity for *Oreochromis niloticus* and before this stage for *Chrysichthys nigrodigitatus*.

**Keywords:** Population parameters, reservoirs, fish stocks, Sassandra River, hydroelectric reservoirs

1. **INTRODUCTION**

Taï National Park is one of the protected areas in Côte d'Ivoire and one of the largest remaining tropical rainforests in West Africa. Initially designated as a Forest Reserve in 1926 and promoted to National Park status in 1972, Taï was recognised as a UNESCO Biosphere Reserve in 1978 and added to the list of Natural World Heritage Sites in 1982. The Hana River is the main river of the Taï National Park. This river is essential for the fauna diversity of these park ecosystems, either as a source of water supply, or as a permanent habitat for aquatic fauna such as fish (Berté et al., 2014). The Ivorian hydrographic network includes rivers, streams, hundreds of agro-pastoral dam lakes and a lagoon system covering 1500 km2 connected to the Atlantic Ocean (Golé Bi *et al*., 2005). Several hydroelectric reservoirs have been built on the rivers. These include the reservoirs of Ayamé 1 and 2, Kossou, Buyo, Taabo and Soubré. They represent today the biggest inland fisheries of the country (FAO, 2005). The Buyo hydroelectric reservoir, the second largest in the country, was initially built on the Sassandra River and one of its main tributaries, the N'ZO stream, which runs alongside the Taï National Park (Tia and Touré, 2016). It contains around 8.4 billion m3 of water (Mel, 2003), also used to supply drinking water in peripheral urban centres (Ohou-Yao *et al*., 2012).

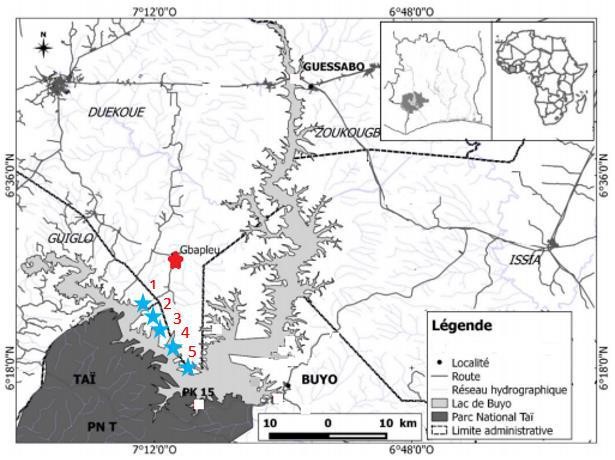
A recent study of the ichthyological composition of the Sassandra River, including the Buyo hydroelectric reservoir, made it possible to inventory forty-two species belonging to fourteen families. The Buyo hydropower dam is located in the Nawa region, in the southwest of Côte d’Ivoire.The Buyo dam provides surface drinking water, and annual fishing is estimated to be 3,900 tons (Ekissi et al., 2021). The Cichlidae (23.59%) are the most represented numerically. *Chrysichthys nigrodigitatus* (12.93% in Lake Buyo and 13.97% in the fluvial section) is another important species (Yao *et al*., 2021). In practice, there is no real management policy for this fishery to ensure its sustainable exploitation, apart from some unannounced checks by agents of the Ministry of Animal Resources and Fisheries. In these conditions, assessing the exploitation level of the main fish species regularly present in the catches could help to provide indicators of the health of this fishery.

This assessment study of the level of exploitation of fish stocks was carried out in the Gbapleu sector of the Buyo hydroelectric reservoir, on the edge of the Taï National Park. The aim was to identify the fishing gears used by fishermen and to determine the exploitation parameters of *Oreochromis niloticus* and *Chrysichthys nigrodigitatus* stocks.

1. **MATERIALS AND METHODS**

**2.1 Study area**

The Buyo hydroelectric reservoir, with an area of 920 km², is located between 6°10’00” and 6°20’00” North latitude and 7°00’0” and 7°10’0” West longitude (Adopo *et al.*, 2023). It extends over several departments in western Côte d'Ivoire. These are Buyo, Issia, Daloa, Duekoué and Guiglo. Fisheries activities are managed through five sectors, each housing an aquaculture and fisheries office. The Duekoué sector is located in Gbapleu, where this study was conducted. Gbapleu is located in the median part of the reservoir between the upper reaches corresponding to the Guessabo zone and the lower reaches corresponding to the Buyo zone and the entire section bordering the Taï National Park. The sampling sites selected were the village of Kéitadougou and the Kodjan, Sramougou, Raphat and Zoba camps (Figure 1).



**Fig. 1.** Buyo hydroelectric reservoir and sampling sites 1-Keïtadougou, 2-Kodjan, 3-Sramougou, 4-Raphat, 5-Zoba (Map source Goli Bi *et al.* (2019), modified).

**2.2 Sampling and data collection**

Data were collected from May 2022 to June 2023. The fishing gears have been characterised. A total of 1794 specimens of *Oreochromis niloticus* and 1787 specimens of *Chrysichthys nigrodigitatus* were sampled from the local fishermen's catches. The total length of each fish sampled was measured using an ichthyometer graduated in millimetres. In addition, 357 and 264 *Oreochromis niloticus* and *Chrysichthys nigrodigitatus* specimens, respectively, were weighed with an electronic scale to the nearest gram to study the length-weight relationship.

**2.3 Data processing**

**2.3.1 Growth parameters**

*2.3.1.1 Length-weight relationship parameters*

Fisheries management models incorporate the parameters of the length-weight relationship. Ricker's (1973) formula W=aLb was used with W the weight of the fish in g, L the total length in cm, a the y-intercept and b the allometry coefficient. The parameters a and b have been determined after logarithmic transformation of the equation lnW=b lnLt+lna.

*2.3.1.2 Length-age relationship*

Von Bertalanffy's (1938) equation was used to model length at age (Sparre and Venema, 1996): Lt=L∞(1-e- k (t-to)) with Lt (cm) the predicted total length at age t, L∞ the asymptotic length (cm) or length of the species if it continues to grow indefinitely and K (yr-1) the growth rate or the rate at which the species grows towards L∞. The parameter t0, the age at which the fish has zero size, was obtained from Pauly's (1980) equation log10(-t0)=-0,3922-0,2752xlog10(L∞)-1,038xlog10(K). These growth parameters were used to calculate the longevity tmax=3/K (Gayanilo *et al*., 2005).

**2.3.2 Mortality parameters**

Pauly's (1984) length-converted catch curve method was used to determine the total mortality (Z). On this bell-shaped curve, the ascending part corresponds to partially captured specimens and the descending part to the fully captured ones. The total mortality (Z) represents the slope b of the descending part after changing sign. The natural mortality (M) was derived from Pauly’s (1980) equation: Log10(M)=-0,0066-0,279Log10(L∞)+0,6543Log10(K+0,4634Log10(T) with M the natural mortality, L∞ the asymptotic length, K the growth rate and T the mean annual water temperature (oC). The water temperatures were recorded monthly. Knowing Z and M, fishing mortality (F) was deduced from the relationship Z=M+F (Gayanilo *et al*., 2005).

**2.3.3 Exploitation rate (E)**

This parameter was calculated from the equation E=F/Z, where F is fishing mortality and Z is total mortality. This rate is used to assess the state of the stock. When E is equal to 0.5, the stock is optimally exploited, and if E is less than 0.5, the stock is underexploited. Finally, when E is greater than 0.5, the stock is overexploited (Gulland, 1971).

**2.3.4 Lengths at probabilities of capture**

The ascending part of Pauly's (1984) length-converted catch curve was used to generate the probabilities of capture. These probabilities of capture are calculated by the ratio of the numbers actually caught to those that "ought" to have been caught for each length group class. The capture probability sizes L25, L50 and L75 correspond respectively to the lengths at which 25%, 50% and 75% of the fish are retained by the fishing gear (Gayanilo *et al*., 2005).

**2.3.5 Relative yield (Y‘/R) and relative biomass (B’/R) per recruit**

Relative yield per recruit (Y‘/R) is used to determine the relationship between yield and fishing effort for different lengths of first capture (L50). Using the input parameters L∞, K and M, the plots of Y‘/R vs E(E=F/Z) and B’/R vs E(E=F/Z) are used to estimate Emax, E0.1 and E0.5. Emax is the exploitation rate that maximises the relative yield per recruit, E0.1 is the exploitation rate at which the marginal increase in relative yield per recruit is 10% of its value at E=0, and E0.5 is the exploitation rate that reduces the stock to half its virgin biomass. The selection ogive option has been used to estimate these parameters (Gayanilo *et al*., 2005).

**2.3.6 Virtual Population Analysis (VPA)**

This method reconstructs the population from the total catch data by age or by size. It uses L∞ and K as input parameters to provide information on natural mortality, fishing mortality and survivors by length class (Sparre and Venema, 1996).

1. **RESULTS**

**3.1 Fishing gears**

Fishermen used five fishing gear types. These were gillnets, different traps, longlines, sparrow hawks and seine nets. A total of 168 fishing gears were counted. The gillnets (41.21%) and traps (32.31%) were the most used (Table 1). The gillnets used were between 50 and 100 m long, with a height of less than 3 m (22.39%) or between 3 and 4 m (77.71%). Their bar length was between 20 and 40 mm. The seine nets were between 100 and 300 m long, with a height of 7 to 10 m, and made with nets with bar lengths of 6 mm (33.33%) and 20 mm (66.67%).

**Table 1.** Percentage offishing gear types used by fishermen

|  |  |  |
| --- | --- | --- |
|  | **Fishing gear** | **Percentage (%)** |
|  | Gillnets | 41.21% |
|  | Traps | 32.31% |
|  | Longlines | 6.43% |
|  | Sparrow hawks | 4.31% |
|  | Seine nets | 15.74% |
|  |  | **100.00%** |

**3.2 Growth parameters**

The allometry coefficients resulted from the length-weight relationship were 2.814 and 2.902, respectively, for *Oreochromis niloticus* and *Chrysichthys nigrodigitatus*. According to the Von Bertalanffy equation, an asymptotic length L∞=34.13 cm and a growth rate K=0.39/year were obtained for the *Oreochromis niloticus* stock, whereas for *Chrysichthys nigrodigitatus*, these were L∞=57.23 cm and K=0.230/year. This results in longevities of tmax=7.67 years for *Oreochromis niloticus* and tmax =13.03 years for *Chrysichthys nigrodigitatus* (Table 2).

**Table 2.** Growth parameters for the two species

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Growth parameters** | **Species** |  | **Length (cm)** | | **Weight (g)** | |  |  |  |  |  |
|  | **N** | **Min** | **Max** | **Min** | **Max** | **a** | **b** | **r2** | **t** | **A** |
|  | Length-weight relationship | *O. niloticus* | 357 | 10.8 | 26.4 | 22 | 326 | 0.048 | 2.814 | 0.96 | 3.16 | A- |
|  | *C. nigrodigitatus* | 264 | 12.9 | 48.4 | 17 | 1238 | 0.038 | 2.902 | 0.94 | 3.27 | A- |
|  | Length-age relationship |  | **Growth parameters** | | | | | | | | | |
|  |  | **L∞ (cm)** | | **K (an-1)** | | **t0 (an)** | **tmax** | | |  | |
|  | *O. niloticus* | 34.13 | | 0.390 | | -0.42 | 7.69 | | |  | |
|  | *C. nigrodigitatus* | 57.23 | | 0.230 | | -0.61 | 13.03 | | |  | |

**[N, number of specimens; Min, minimum; Max, maximum; a, constant; b, allometry coefficient; r2, coefficient of determination; t, Student's t-test; A, allometry; L∞, asymptotic length; K, growth rate; t0, theoretical age at which length is zero, tmax and longevity]**

**3.3 Exploitation parameters: Mortality parameters, exploitation rates, lengths at capture probabilities and reference points for relative yield (Y‘/R) and relative biomass (B’/R) per recruit.**

The values of these parameters are presented in the Table 3. In the fishing area, the stock of *Oreochromis niloticus* suffered greater mortality (Z=1.18) than that of *Chrysichthys nigrodigitatus* (Z=0.59). This results in exploitation rates corresponding to E=0.20 for *Oreochromis niloticus* and E=0.02 for *Chrysichthys nigrodigitatus* (Figures 2A and 2B). According to the other reference points, the lengths of first capture (L50) were estimated at 13.65 cm for *Oreochromis niloticus* and 12.37 cm for *Chrysichthys nigrodigitatus* (Figures 3A and 3B). The exploitation rate that reduces the virgin biomass of *Oreochromis niloticus* stock by half was E50=0.331 compared with E50=0.274 for *Chrysichthys nigrodigitatus*. These exploitation rates were lower than the economic exploitation rates, which correspond to E10=0.509 for *Oreochromis niloticus* and E10=0.358 for *Chrysichthys nigrodigitatus*. The exploitation rates that maximise the relative yield per recruit remained the highest. These were respectively Emax=0.649 and Emax=0.470 for *Oreochromis niloticus* and *Chrysichthys nigrodigitatus* (Figures 4A and 4B).

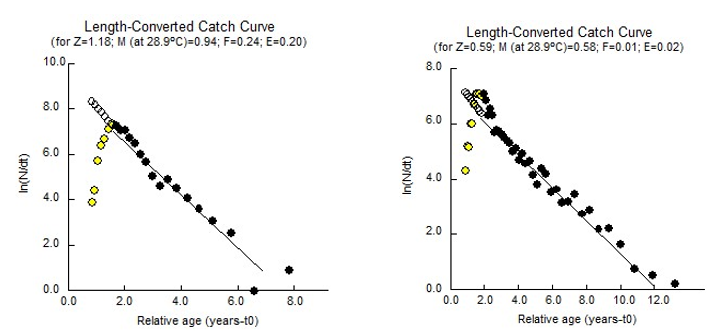
**Table 3.** Values of mortality parameters, exploitation rate, length at capture probabilities and reference points for relative yield (Y‘/R) and relative biomass (B’/R) per recruit

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Species** | **Mortality parameters** | | | **Exploitation rate (E)** | **Lengths at capture probabilities** | | | **Exploitation rate references to Y’/R and B’/R** | | |
|  | **Z** | **M** | **F** |  | **L25** | **L50** | **L75** | **E50** | **E10** | **Emax** |
| *O. niloticus* | 1.18 | 0.94 | 0.24 | 0.20 | 12.65 | 13.65 | 14.66 | 0.331 | 0.509 | 0.649 |
| *C. nigrodigitatus* | 0.59 | 0.58 | 0.01 | 0.02 | 11.69 | 12.37 | 13.05 | 0.274 | 0.358 | 0470 |

**[Z, total mortality; M, natural mortality; F, fishing mortality; E, exploitation rate; L25, L50 and L75, length at capture probabilities of 25%, 50% and 75% of fish; E50, E10 and Emax, exploitation rate at relative yield and relative biomass per recruit]**

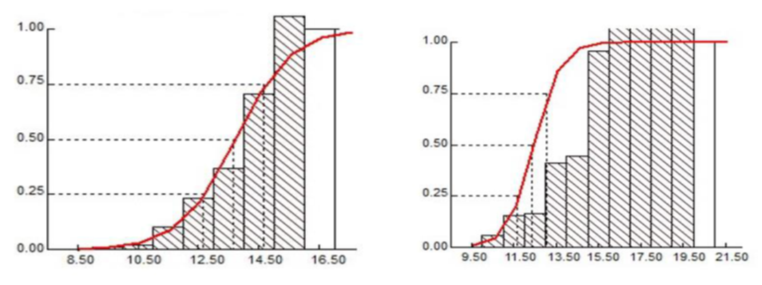
**3.4 Virtual Population Analysis**

For *Oreochromis niloticus*, specimens between 15 cm and 21 cm were the most abundant in catches, while the highest fishing mortality was noted in the length class [18-19 cm]. However, the length classes with the highest fishing mortality were between 16 and 21 cm. For *Chrysichthys nigrodigitatus*, on the other hand, catches were dominated by specimens between 16 and 22 cm. However, the length classes most affected by fishing mortality were specimens larger than 46 cm, although these were less represented in the catches. Finally, for *Oreochromis niloticus*, the most exploited size classes provided the greatest biomass, unlike for *Chrysichthys nigrodigitatus* (Table 4).



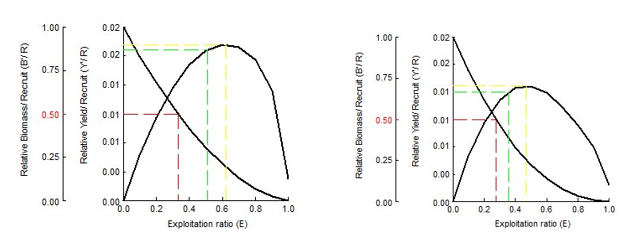
*A- O. niloticus* *B- C. nigrodigitatus*

**Fig. 2.** Length-converted catch curve for estimation of mortality parameters and exploitation rate



*A- O. niloticus* *B- C. nigrodigitatus*

**Fig. 3.** FiSAT II output of probability of capture for the two species



*A- O. niloticus* *B- C. nigrodigitatus*

**Fig. 4.** Beverton and Holt’s relative yield per recruit and relative biomass per recruit results produced through Ogive routine method

**Table 4.** Numeric results of the Virtual Populations Analysis

*A- O. niloticus* *B- C. nigrodigitatus*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mid-Length | Catch (in numbers) | Population (N) | Fishing mortality (F) | Steady-state Biomass (tonnes) |
| 9.5 | 5 | 13689.55 | 0.0037 | 0.04 |
| 10.5 | 9 | 12408.44 | 0.007 | 0.05 |
| 11.5 | 35 | 11196.47 | 0.0291 | 0.07 |
| 12.5 | 71 | 10031.94 | 0.0633 | 0.08 |
| 13.5 | 99 | 8906.8 | 0.0953 | 0.09 |
| 14.5 | 164 | 7831.19 | 0.1722 | 0.1 |
| 15.5 | 211 | 6772.04 | 0.2453 | 0.11 |
| 16.5 | 211 | 5752.46 | 0.2751 | 0.12 |
| 17.5 | 182 | 4820.41 | 0.2683 | 0.12 |
| 18.5 | 191 | 4000.81 | 0.3221 | 0.13 |
| 19.5 | 145 | 3252.37 | 0.2825 | 0.13 |
| 20.5 | 125 | 2624.89 | 0.2833 | 0.13 |
| 21.5 | 82 | 2085.09 | 0.2173 | 0.12 |
| 22.5 | 63 | 1648.3 | 0.1959 | 0.12 |
| 23.5 | 37 | 1282.95 | 0.1357 | 0.12 |
| 24.5 | 27 | 989.56 | 0.1175 | 0.11 |
| 25.5 | 40 | 746.53 | 0.2128 | 0.1 |
| 26.5 | 31 | 529.82 | 0.2097 | 0.09 |
| 27.5 | 23 | 359.83 | 0.2042 | 0.08 |
| 28.5 | 17 | 230.97 | 0.2071 | 0.06 |
| 29.5 | 12 | 136.79 | 0.2138 | 0.05 |
| 30.5 | 9 | 72.03 | 0.2614 | 0.03 |
| 31.5 | 1 | 30.66 | 0.0518 | 0.02 |
| 32.5 | 4 | 11.52 | 0.5 | 0.01 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Mid-Length** | **Catch (in numbers)** | **Population**  **(N)** | **Fishing mortality (F)** | **Steady-state Biomass (tonnes)** |
|
|
|
| 10.5 | 7 | 15209.3 | 0.0051 | 0.03 |
| 11.5 | 17 | 14403.46 | 0.0128 | 0.04 |
| 12.5 | 17 | 13614.13 | 0.0132 | 0.05 |
| 13.5 | 40 | 12851.28 | 0.0323 | 0.06 |
| 14.5 | 41 | 12092.28 | 0.0344 | 0.07 |
| 15.5 | 83 | 11359.46 | 0.0725 | 0.08 |
| 16.5 | 126 | 10612.79 | 0.1154 | 0.09 |
| 17.5 | 131 | 9853.48 | 0.1262 | 0.11 |
| 18.5 | 133 | 9120.59 | 0.1352 | 0.12 |
| 19.5 | 126 | 8416.92 | 0.1353 | 0.13 |
| 20.5 | 138 | 7750.89 | 0.1571 | 0.15 |
| 21.5 | 114 | 7103.27 | 0.1377 | 0.16 |
| 22.5 | 69 | 6509.18 | 0.0883 | 0.17 |
| 23.5 | 90 | 5986.75 | 0.122 | 0.18 |
| 24.5 | 73 | 5468.78 | 0.1051 | 0.2 |
| 25.5 | 41 | 4993.01 | 0.0626 | 0.21 |
| 26.5 | 45 | 4572.13 | 0.0728 | 0.22 |
| 27.5 | 45 | 4168.71 | 0.0774 | 0.23 |
| 28.5 | 42 | 3786.55 | 0.077 | 0.24 |
| 29.5 | 38 | 3428.14 | 0.0744 | 0.25 |
| 30.5 | 35 | 3093.82 | 0.0733 | 0.26 |
| 31.5 | 34 | 2781.89 | 0.0764 | 0.27 |
| 32.5 | 26 | 2489.79 | 0.0628 | 0.27 |
| 33.5 | 30 | 2223.69 | 0.0782 | 0.27 |
| 34.5 | 21 | 1971.04 | 0.0592 | 0.28 |
| 35.5 | 28 | 1744.18 | 0.0857 | 0.28 |
| 36.5 | 20 | 1526.63 | 0.0668 | 0.28 |
| 37.5 | 23 | 1332.94 | 0.0842 | 0.27 |
| 38.5 | 15 | 1151.42 | 0.0604 | 0.27 |
| 39.5 | 11 | 992.34 | 0.0488 | 0.26 |
| 40.5 | 21 | 850.51 | 0.1037 | 0.26 |
| 41.5 | 18 | 712.02 | 0.1003 | 0.24 |
| 42.5 | 10 | 589.93 | 0.063 | 0.23 |
| 43.5 | 12 | 487.91 | 0.0861 | 0.22 |
| 44.5 | 8 | 395.08 | 0.066 | 0.2 |
| 45.5 | 9 | 316.82 | 0.0864 | 0.19 |
| 46.5 | 13 | 247.44 | 0.1497 | 0.17 |
| 47.5 | 7 | 184.06 | 0.0986 | 0.14 |
| 48.5 | 9 | 135.88 | 0.1588 | 0.12 |
| 49.5 | 5 | 94.01 | 0.1141 | 0.1 |
| 50.5 | 6 | 63.59 | 0.1848 | 0.08 |
| 51.5 | 4 | 38.76 | 0.1785 | 0.06 |
| 52.5 | 2 | 21.77 | 0.1361 | 0.04 |
| 53.5 | 2 | 11.24 | 0.2356 | 0.02 |
| 54.5 | 2 | 4.32 | 0.5 | 0.01 |

1. **DISCUSSION**

Five fishing gear categories were used in the study area. These were gillnets, different models of traps, longlines, sparrow hawks and seine nets. The use of these fishing gears has been reported in Ivorian inland fisheries by Traoré (1996), Shep *et al.* (2013) and Diaby *et al*. (2020). According to the fishermen, the objectives were to operate fishing in different depths of the reservoir to catch pelagic and benthic species. In fact, the ichthyological composition of the Buyo hydroelectric reservoir showed many species belonging to the orders of Siluriformes and Cichliformes, known respectively as benthic and pelagic fish (N'Dri *et al*., 2020).

On the reservoir, fishermen had a preference for gillnets (41.21%) and traps (32.31%). Fishermen's preference for gillnets was also reported by Shep *et al*. (2013) in Ivorian inland fisheries. This situation could be related to their relatively low cost, their easy confection and also to the fact that they do not use baits. However, the use of seines with a bar length of 6 mm and 20 mm, as well as gillnets with a bar length between 20 and 40 mm, represents offences. In fact, the current Ivorian legislation prohibits the use of seines and gillnets with bar length less than 35 mm in inland fisheries (JORCI, 1981). This situation explains the presence of small specimens (9 to 10 cm) of *Oreochromis niloticus* and *Chrysichthys nigrodigitatus* in the catches. The fishing practices need to be monitored in the study area.

With regard to growth parameters, the allometry coefficients of the length-weight relationship corresponded to 2.814 and 2.902, respectively, for *Oreochromis niloticus* and *Chrysichthys nigrodigitatus*. These values, lower than the theoretical value of 3, indicate a negative allometry. In other words, weight gain is slower than length growth for the two species (Harchouche, 2006).

The parameters of the Von Bertalanffy equation corresponded to an asymptotic length L∞=4.13 cm and a growth rate K=0.39/year for *Oreochromis niloticus* and to L∞=57.23cm and K=0.230/year for *Chrysichthys nigrodigitatus*. The longevities calculated from these parameters showed that in the fishery, *Chrysichthys nigrodigitatus* has a longer lifespan (tmax = 13.03years) than *Oreochromis niloticus* (tmax= 7.67years). In addition, these growth parameters provided mortality values for which natural mortality was higher than fishing mortality (M=0.94 and F=0.24 for *Oreochromis niloticus*; M=0.58 and F=0.01 for *Chrysichthys nigrodigitatus*) for both species. As a result, these fish die more from natural causes than from fishing.

The current exploitation rates were E=0.20 for *Oreochromis niloticus* and E=0.02 for *Chrysichthys nigrodigitatus*. According to Gulland (1971), the stock of a species is underexploited when the value of this parameter is less than 0.5. So, the stocks of these two species are therefore underexploited. This situation is confirmed by the fact that these current exploitation rates were still lower for both species than the exploitation rates that reduce the virgin biomass by half (E50=0.331for *Oreochromis niloticus*, E50=0.274 for *Chrysichthys nigrodigitatus*), the economic exploitation rates (E10=0.509 for *Oreochromis niloticus*, E10=0.358 for *Chrysichthys nigrodigitatus*) and the exploitation rates that maximise the relative yield per recruit (Emax=0.649 for *Oreochromis niloticus*, Emax=0.470 for *Chrysichthys nigrodigitatus*).

The lengths at which 50% of specimens were vulnerable to fishing gears were estimated at 13.65 cm for *Oreochromis niloticus* and 12.37 cm for *Chrysichthys nigrodigitatus*. *Oreochromis niloticus* sexual maturity in the Ivorian inland waters is reached between 10.5 cm and 12.9 cm (Lévêque *et al.*, 2006), while Albaret (1982) notes 195 mm as the size of the smallest sexually mature female of *Chrysichthys nigrodigitatus* encountered in the Ivorian continental waters. So, half of the *Oreochromis niloticus* specimens were caught just after reaching sexual maturity, whereas *Chrysichthys nigrodigitatus* specimens were caught before reaching this physiological stage, which could be detrimental to the renewal of their stocks.

1. **CONCLUSION**

This study provides the first information on the exploitation parameters of *Oreochromis niloticus* and *Chrysichthys nigrodigitatus* stocks in the Buyo hydroelectric reservoir bordering the Taï National Park. In this area, fishermen use seven fishing gear types, with a preference for gillnets and seines. For both stocks, the populations decrease more from natural causes than fishing, and their stocks are under-exploited. However, the use of seine nets and gillnets with bar length lower than 35 mm represents a danger for the renewal of the stocks of the two species.

**DISCLAIMER (ARTIFICIAL INTELLIGENCE)**

Authors hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to image generators have been used during writing or editing of this manuscript.

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