

## Research Article

# Diversity of Fresh Fish Sold at the Carrière Landing Stage Located Along Lake Sélingué in Mali

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## Abstract

Lake Sélingué is one of the main fish production areas in Mali. The fish are concentrated at the Carrière landing stage, in the Prefecture of, before being transported to urban centers. The purpose of this contribution is to establish the list of fresh fish landed at this landing stage, coming from the waters of Lake Sélingué. The study was spread over a period of 10 months with one outing per month. Landed fish were identified on site and then counted by species to determine specific diversity, frequency and groups based on occurrence. The results showed the presence of 56 species of fish distributed in 17 families and 35 genera. The Mormyridae family with 10 species is the best represented in the landing stage, followed by the Alestidae, Cichlidae, Cyprinidae and Mochokidae with 6 species each. Eight (8) species represented 71.92% of the catches, the most frequent of which were *Chrysichthys auratus*, *Sarotherodon galilaeus* and *Coptodon zillii*. *Mochokus niloticus* and *Marcusenius cyprinoides* are added to the list of fish recorded in the area of Lake Sélingué. The fish consisted of 50% constant species, 17.86% incidental species and 32.14% accidental species. The specific diversity index is 4.19 with a maximum diversity of 5.80. Given the great diversity of species, the Carrière landing stage could serve as a reference site for research and conservation of ichthyological diversity.

## Keywords

Fish, Diversity, Frequency, Occurrence, Sélingué Dam Lake, Mali

## 1. Introduction

Fish are an important source of animal protein and income for populations [1]. As such, many communities have become involved in fishing, which involves extracting fish and other aquatic organisms from inland waters [2]. In dammed lakes, fishing is one of the main activities of riverside communities and constitutes real threats to the survival of fish [3, 4]. In

Mali, fish production is estimated at 133,940 tonnes in 2023 [5]. There are three main fish production areas, the central Niger Delta and two dam lakes, namely, Lake Sélingué and Lake Manantali [6]. The Sélingué dam lake supplies fish to many urban centers in the country and is the subject of intensive fishing. According to many authors, species of high

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commercial value were landed there [3, 6-8]. Regarding the diversity of the ichthyological fauna of Lake Sédingué [7] reported 91 species of fish without highlighting the species from the main landing stage of Carrière which concentrates the majority of the production. The fish list of a landing stage refers to the species richness, species diversity and occurrence of the species in the watercourse that shelters the landing stage. These factors are indicators because species richness allows us to monitor the diversity of landed fish while species richness allows us to monitor the resilience of ecosystems in response to anthropogenic pressures [9] and occurrence determines the constancy of species [10]. The establishment of the list of fish at the Carrière landing stage located along Lake Sédingué will make it possible to monitor the evolution of the specific diversity of fresh fish sold. This study was initiated in order to inventory fish species and determine their occurrence in catches at the Carrière landing stage of Lake Sédingué.

## 2. Materials and Methods

### 2.1. Presentation of the Study Area

The Sédingué dam is located on the Sankarani River, a right-bank tributary of the Niger River, approximately 150 km southwest of the city of Bamako [11]. It is the only large dam in the upstream part of the Upper Niger Basin in Guinea and Mali [12]. The lake, 80 km long, covers an area of 409 km<sup>2</sup>, with an average depth of 5 m and can contain up to 2.2 billion m<sup>3</sup> of water [8]. Average annual rainfall varies from 1,200 to 1,400 mm, with average annual temperatures ranging from 23.78 °C in January-February to 28.6 °C in March-April. The quarry landing stage is located 3 km from the foot of the Selingue hydroelectric dam (Figure 1). It concentrates a good part of the catches around the lake to be transported to urban centers [13]. Fishing is a very flourishing activity along Lake Sédingué and is practiced all year round.

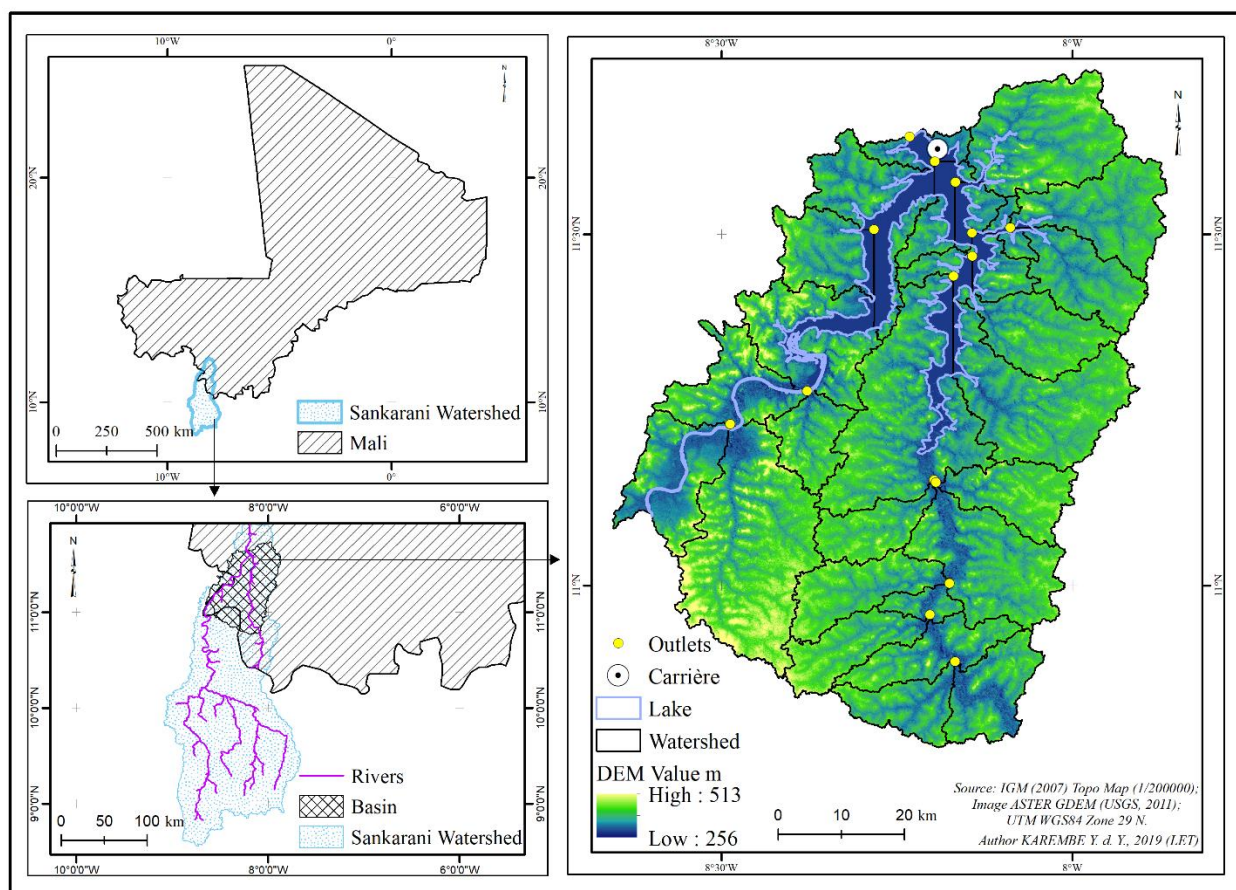


Figure 1. Location of the study area, source [13].

### 2.2. Fish Species Identification

The data collected were gathered over 10 months between 2020 and 2021. Fishing is carried out using cast

nets, gill nets and traps which are the most commonly used fishing gear [13]. The identification consisted of examining the fish caught and landed at the Carrière landing site using the determination key of [14, 15] then the fish were classified into family, genus and species.

## 2.3. Data Processing

The data collected made it possible to determine the species richness, the specific diversity index, the percentage of occurrence and the frequency of the species. Specific richness (S) is the number of species recorded in the landing stage.

The specific diversity index measures the distribution of abundance between the taxa (number) encountered in the landing stage. It is estimated by the formula [16] of, below:

$H = -\sum P_i \log_2 P_i$  où  $P_i$  = proportions of individuals of species  $i$  in all individuals of the population;  $i$  = index representing a species in the set of  $S$  species recorded in the community,  $i$  varying from 1 à  $S$ ;  $S$  = specific richness, reflecting the quality of organization of the community.  $H = 0$ , for a single species, to  $\log_2 S$  when all species have the same abundance. The percentage of occurrence is the frequency of appearance of the species encountered in the landing stage. It is given by the formula  $F = (F_i \cdot 100) / F_t$  where  $F_i$  is the

number of appearances of the species and  $F_t$  the number of exits. According to authors [10], the species are constant when  $F$  is greater than or equal to 50%, accessory for  $F$  between 25 and 50% and accidental for species whose  $F$  is less than 25%.

## 3. Results

### 3.1. Fish Diversity

Fish identification work has resulted in the identification of 56 species, 35 genera, and 17 families. The Mormyridae family was the most represented with 10 species, followed by the Alestidae, Cichlidae, Cyprinidae and Mochokidae families with 6 species each, then the Schilbeidae family with 4 species, and Clariidae. The other families were represented by 1 to 3 species (Table 1).

**Table 1.** Composition of fish communities found at the Carriere landing stage.

| Family                       | Gender                                   | Species                                      | Common names                 | Local name      |
|------------------------------|------------------------------------------|----------------------------------------------|------------------------------|-----------------|
| Alestidae Cockerell, 1990    | <i>Alestes</i> Müller and Troschel, 1844 | <i>dentex</i> (Linnaeus, 1758)               | Voleur du Nil                | Fono            |
|                              |                                          | <i>leuciscus</i> (Günther, 1867)             | Téras à nageoire jaunes      | Tineni          |
|                              | <i>Brycinus</i> Valenciennes, 1849       | <i>macrolepidotus</i> Valenciennes, 1849     | Grandes écailles argentées   | Koolo           |
|                              |                                          | <i>nurse</i> (Rüppel, 1832)                  | Infirmière téra              | N'zara kubilén  |
|                              | <i>Hydrocynus</i> Cuvier, 1817           | <i>brevis</i> (Günther, 1864)                | Poisson tigre africain       | Wuluj ègè       |
|                              |                                          | <i>forkalii</i> (Cuvier, 1819)               | Poisson chien africain       | Bala            |
| Bagridae Bleeker, 1858       | <i>Bagrus</i> Bosc, 1816                 | <i>bajad</i> (Forsk., 1775)                  | Bayad ou poisson-chat        | Samudjè         |
|                              |                                          | <i>docmak</i> (Forsk., 1775)                 | Poisson-chat                 | Samufing        |
| Centropomidae Poey, 1868     | <i>Lates</i> Cuvier, 1828                | <i>niloticus</i> (Linnaeus, 1762)            | Capitaine d'eau douce        | Saalen          |
|                              |                                          | <i>bimaculatus</i> Gill, 1862                | Cichlid éjoyou à deux tâches | Jonmuso N'tèben |
|                              | <i>Hemichromis</i> Peters, 1858          | <i>fasciatus</i> Peters, 1852                | Poisson-bijou à bandes       | Kerebuga        |
| Cichlidae Heckel, 1840       | <i>Oreochromis</i> Günther, 1889         | <i>niloticus</i> (Linnaeus, 1758)            | Tilapia du Nil               | N'tèben fíng    |
|                              | <i>Sarotherodon</i> (Rüppel, 1852)       | <i>galilaeus</i> (Linnaeus, 1758)            | Tilapia de Galilée           | N'tèben djè     |
|                              |                                          | <i>dageti</i> Thys van den Audenaerde, 1971  | Tilapia de Daget             | Taka            |
|                              | <i>Coptodon</i> Gervais, 1848            | <i>zillii</i> (Gervais, 1848)                | Poisson de Saint-Pierre      | Taka n'tèben    |
| Citharinidae (Günther, 1864) | <i>Citharinus</i> Cuvier, 1817           | <i>citharus</i> Geoffroy Saint-Hilaire, 1809 | Lute fish                    | Tala djè        |
| Clariidae Bonaparte, 1846    | <i>Heterobranchus</i> Valenciennes,      | <i>bidorsalis</i> (Geoffroy                  | Poisson-chat africain        | Poliyobilen     |

| Family                        | Gender                                       | Species                                                | Common names                  | Local name   |
|-------------------------------|----------------------------------------------|--------------------------------------------------------|-------------------------------|--------------|
| Claroteidae Bleeker, 1862     | 1840                                         | Saint-Hilaire, 1990)                                   |                               |              |
|                               |                                              | <i>longifilis</i> Valenciennes, 1840                   | Poisson-chat africain         | Polyofing    |
|                               | <i>Clarias</i> Scopoli, 1777                 | <i>anguillaris</i> (Linnaeus, 1758)                    | Silure du S égal              | Manogo       |
|                               | <i>Auchenoglanis</i> Günther, 1865)          | <i>biscutatus</i> (Geoffroy Saint-Hilaire, 1808)       | Poisson-chat                  | Korokoto     |
|                               |                                              | <i>auratus</i> Geoffroy Saint-Hilaire, 1808            | Poisson-chat du Nil dor é     | N'kérèbilen  |
|                               | <i>Chrysichthys</i> Bleeker, 1816            | <i>nigrodigitatus</i> (Lac é ède, 1803)                | M âchoiron ou poisson-chat    | N'kérèdjè    |
|                               |                                              | <i>ablades</i> (Bleeker, 1863)                         | Barbu                         | Miri         |
|                               |                                              | <i>sp.</i>                                             | Barbu                         | Miri         |
|                               | <i>Garra</i> Hamilton, 1822                  | <i>waterloti</i> (Pellegrin, 1935)                     | -                             | -            |
|                               |                                              | <i>senegalensis</i> (Valenciennes, 1842)               | Carpe africaine               | Bama dj è    |
| Cyprinidae Rafinesque, 1815   | <i>Labeo</i> Cuvier, 1817                    | <i>coubie</i> Rüppell, 1832                            | Carpe noire africaine         | Bama fing    |
|                               |                                              | <i>roseopunctatus</i> Paugy, Gu é gan et Agn èse, 1989 | Carpe rouge africaine         | Bama bilen   |
|                               |                                              | <i>brevipinnis</i> Günther, 1864                       | Kiki                          | Galiya       |
|                               |                                              | <i>engycephalus</i> Günther, 1864                      | Perche                        | Kalesum è    |
| Distichodontiae Günther, 1864 | <i>Distichodus</i> Müller and Troschel, 1845 | <i>rostratus</i> Günther, 1864                         | Mangeur d'herbes              | Sonon Galiya |
| Gymnarchidae Cuvier, 1829     | <i>Gymnarchus</i> Cuvier, 1829               | <i>niloticus</i> (Cuvier, 1829)                        | Poisson cheval                | So dj èg è   |
| Malapteruridae Bleeker, 1858  | <i>Malapterurus</i> Lac é ède, 1803          | <i>electricus</i> Gmelin, 1789                         | Poisson-chat éctrique du Nil  | N'tigi       |
|                               |                                              | <i>batensoda</i> Rüppell, 1832                         | Poisson-chat géant à l'envers | Konkon dj è  |
|                               |                                              | <i>clarias</i> (Linnaeus, 1758)                        | Synodontite à queue rouge     | Goni dj è    |
| Mochokidae Jordan, 1923       | <i>Synodontis</i> Cuvier, 1817               | <i>nigrita</i> Valenciennes, 1840                      | Faux poisson-chat à l'envers  | Konkon fing  |
|                               |                                              | <i>membranaceus</i> (Günther, 1864)                    | Poisson-chat d'eau douce      | Sabi konkon  |
|                               |                                              | <i>schall</i> (Bloch et Schneider, 1801)               | Poisson-chat à l'envers       | Konkon bl èn |
|                               | <i>Mochokus</i> (Joannis, 1835)              | <i>niloticus</i> (Joannis, 1835)                       | -                             | -            |
|                               | <i>Hippopotamyrus</i> Pappenheim, 1906       | <i>Paugyi</i> (Bigorne, 1985)                          | Lufulu, Mpimba                | Nana         |
|                               | <i>Campylomormyrus</i> Bleeker, 1874         | <i>tamandua</i> Günther, 1864                          | Poisson- é phant              | Nana dadjan  |
|                               | <i>Hyperopisus</i> Gill, 1862                | <i>bebe</i> Lac é ède, 1803                            | Poisson- é phant d'eau douce  | Wala         |
|                               | <i>Mormyrus</i> Bonaparte, 1831              | <i>senegalensis</i> Steindachner, 1870                 | Poisson- é phant d'eau douce  | Nana dakuru  |
|                               |                                              | <i>Cyprinoides</i> (Linnaeus, 1758)                    | -                             | -            |
|                               |                                              | <i>Mormyrops</i> Müller, 1843                          | Pimpreneau, anguielo,         | Bung é       |

| Family                                           | Gender                              | Species                                      | Common names                          | Local name  |
|--------------------------------------------------|-------------------------------------|----------------------------------------------|---------------------------------------|-------------|
|                                                  |                                     | 1758)                                        | pougau, poun                          |             |
|                                                  | <i>Mormyrus</i> Linnaeus, 1758      | <i>hasselquistii</i> (Valenciennes, 1849)    | -                                     | Nana        |
|                                                  |                                     | <i>rume</i> Valenciennes, 1846               | Concorde                              | Nana dajan  |
|                                                  |                                     | <i>bane</i> Lacépède, 1803)                  | -                                     | Nana dakuru |
|                                                  | <i>Petrocephalus</i> Marcusen, 1854 | <i>soudanensis</i> (Bigorne et Paugy, 1990)  | -                                     | Nana dakuru |
| Osteoglossidae Cuvier, 1829)                     | <i>Heterotis</i> Müller, 1843       | <i>niloticus</i> (Cuvier, 1829)              | Arowana africain du Nil               | Fana        |
| Polypteridae Geoffroy Saint-Saint-Hilaire, 1802) | <i>Polypterus</i> Cuvier, 1829)     | <i>senegalus</i> Cuvier, 1829)               | Anguille-dinosaure ou poisson serpent | Saa dj èg è |
|                                                  | <i>Parailia</i>                     | <i>pellucida</i> (Boulenger, 1901)           | -                                     | -           |
|                                                  |                                     | <i>intermedius</i> Rüppell, 1832             | Poisson -chat au beurre argent é      | Ngari fing  |
| Schilbeidae Bleeker, 1858                        | <i>Schilbe</i> Oken, 1817           | <i>mystus</i> (Linnaeus, 1758)               | Poisson -chat en verre africain       | Ngari dj è  |
|                                                  | <i>Siluranodon</i>                  | <i>auritus</i> Geoffroy Saint-Hilaire, 1827) | -                                     | -           |
| Tetraodontidae Bonaparte, 1832                   | <i>Tetraodon</i> (Linnaeus, 1758)   | <i>lineatus</i> (Linnaeus, 1758)             | T étraodon ray é                      | Dodo        |
| 17                                               | 35                                  | 56                                           |                                       |             |

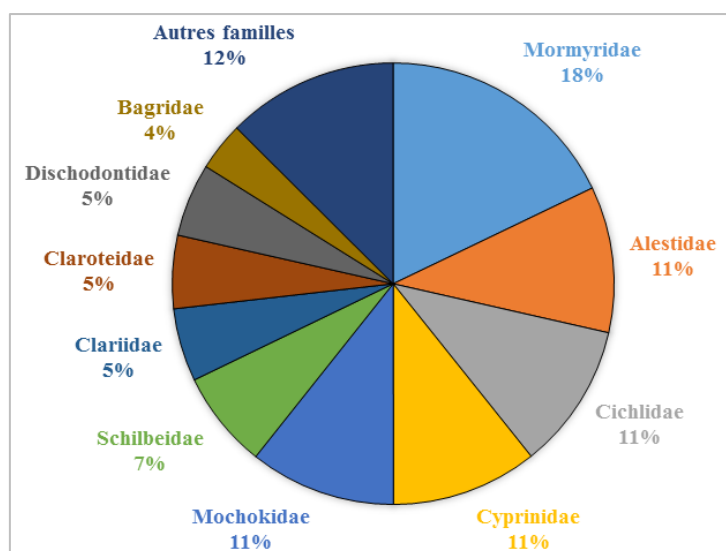


Figure 2. Numerical distribution of species in the families encountered.

The families Mormyridae, Alestidae, Cichlidae, Cyprinidae, Mochokidae, Schilbeidae and Claroteidae represented 88% of the species captured and the other families 12% (Figure 2).

The calculated value of the species diversity index is 4.19 and that of the maximum diversity index is 5.80.

### 3.2. Distribution of Frequency

Based on the collected data, 8 species represented 71.92% of the total catches, namely *Chrysichthys auratus*, *Sarotherodon galilaeus*, *Coptodon zillii*, *Auchenoglanis*

*biscutatus*, *Brycinus leuciscus*, *Schilbe mystus*, *Bagrus bajad* and *Citharinus citharus* (Table 2). The relative frequencies were 14.42% for *Chrysichthys auratus* followed by 14.30% for *Sarotherodon galilaeus* then 12.73% for *Coptodon zillii*, 9.14% for *Auchenoglanis biscutatus*, 6.48% for *Brycinus leuciscus*, 5.61% for *Schilbe mystus*, 5.00% for *Bagrus bajad*

and 4.24% for *Citharinus citharus*. The other species presented frequencies between 0.03% and 3.39% (Table 3). Statistical analysis showed a significant difference between the frequencies of the species inventoried in the Carrière landing stage using the Chi2 test (p-value <0.00001).

**Table 2.** Distribution of numerical frequencies of species observed at the Carrière landing stage.

| Species                                                          | Number | Frequency (%) |
|------------------------------------------------------------------|--------|---------------|
| <i>Chrysichthys auratus</i> (Geoffroy -Saint-Hilaire, 1808)      | 494    | 14,42         |
| <i>Sarotherodon galilaeus</i> (Linnaeus, 1758)                   | 490    | 14,31         |
| <i>Coptodon zillii</i> (Gervais, 1848)                           | 436    | 12,73         |
| <i>Auchenoglanis biscutatus</i> (Geoffroy Saint-Hilaire, 1808)   | 313    | 9,14          |
| <i>Brycinus leuciscus</i> (Günther, 1867)                        | 222    | 6,48          |
| <i>Schilbe mystus</i> (Linnaeus, 1758)                           | 192    | 5,61          |
| <i>Bagrus bajad</i> (Forsk., 1775)                               | 171    | 5,00          |
| <i>Citharinus citharus</i> Geoffroy Saint -Hilaire, 1809         | 145    | 4,23          |
| <i>Labeo senegalensis</i> Valenciennes, 1842                     | 116    | 3,39          |
| <i>Chrysichthys nigrodigitatus</i> (Lacépède, 1803)              | 103    | 3,01          |
| <i>Synodontis schall</i> (Bloch et Schneider, 1801)              | 76     | 2,22          |
| <i>Mormyrus rume</i> (Valenciennes, 1846)                        | 64     | 2,00          |
| <i>Clarias anguillaris</i> (Linnaeus, 1758)                      | 60     | 1,75          |
| <i>Brycinus macrolepidotus</i> Valenciennes, 1849                | 50     | 1,46          |
| <i>Distichodus rostratus</i> (Günther, 1864)                     | 45     | 1,31          |
| <i>Oreochromis niloticus</i> (Linnaeus, 1758)                    | 39     | 1,14          |
| <i>Heterotis niloticus</i> (Cuvier, 1829)                        | 38     | 1,11          |
| <i>Coptodon dageti</i> Thys van den Audenaerde, 1971             | 34     | 1,00          |
| <i>Hydrocynus brevis</i> (Günther, 1864)                         | 30     | 0,88          |
| <i>Bagrus docmak</i> (Forsk., 1775)                              | 30     | 0,88          |
| <i>Petrocephalus soudanensis</i> (Bigorne et Paugy, 1990)        | 27     | 0,80          |
| <i>Distichodus brevipinnis</i> (Günther, 1864)                   | 24     | 0,70          |
| <i>Lates niloticus</i> (Linnaeus, 1762)                          | 23     | 0,67          |
| <i>Synodontis membranaceus</i> (Günther, 1864)                   | 19     | 0,55          |
| <i>Hydrocynus forskalii</i> (Cuvier, 1819)                       | 18     | 0,53          |
| <i>Heterobranchius bidorsalis</i> (Geoffroy Saint-Hilaire, 1990) | 18     | 0,53          |
| <i>Petrocephalus bane</i> (Lacépède, 1803)                       | 18     | 0,50          |
| <i>Mormyrops anguilloides</i> (Linnaeus, 1758)                   | 17     | 0,44          |
| <i>Labeo coubie</i> (Rüppell, 1832)                              | 15     | 0,38          |
| <i>Hemichromis fasciatus</i> (Peters, 1852)                      | 13     | 0,38          |
| <i>Malapterurus electricus</i> (Gmelin, 1789)                    | 13     | 0,32          |
| <i>Brycinus nurse</i> (Rüppell, 1832)                            | 11     | 0,32          |



| Species                                                     | Number | Frequency (%) |
|-------------------------------------------------------------|--------|---------------|
| <i>Labeo roseopunctatus</i> Paugy, Gu égan et Agn èse, 1989 | 8      | 0,23          |
| <i>Campylomormyrus tamandua</i> (G ünther, 1864)            | 7      | 0,20          |
| <i>Marcusenius senegalensis</i> (Steindacher, 1870)         | 7      | 0,20          |
| <i>Marcusenius cyprino ïdes</i> (Linnaeus, 1758)            | 1      | 0,03          |
| <i>Parailia pellucida</i> (Boulenger, 1901)                 | 5      | 0,15          |
| <i>Polypterus senegalus</i> (Cuvier, 1829)                  | 4      | 0,12          |
| <i>Garra waterloti</i> (Pellegrin, 1935)                    | 3      | 0,09          |
| <i>Synodontis clarias</i> (Linnaeus, 1758)                  | 3      | 0,09          |
| <i>Mochokus niloticus</i> (Joannis, 1835)                   | 1      | 0,03          |
| <i>Synodontis batensoda</i> (R üppell, 1832)                | 3      | 0,09          |
| <i>Hyperopisus bebe</i> (Lac ép ède, 1803)                  | 3      | 0,09          |
| <i>Hemichromis bimaculatus</i> (Gill, 1862)                 | 2      | 0,06          |
| <i>Barbus sp.</i>                                           | 2      | 0,06          |
| <i>Barbus ablabes</i> (Bleeker, 1863)                       | 2      | 0,06          |
| <i>Alestes dentex</i> (Linnaeus, 1758)                      | 1      | 0,03          |
| <i>Heterobranchus longifilis</i> Valenciennes, 1840         | 1      | 0,03          |
| <i>Distichodus engycephalus</i> (G ünther, 1864)            | 1      | 0,03          |
| <i>Gymnarchus niloticus</i> (Cuvier, 1829)                  | 1      | 0,03          |
| <i>Synodontis nigrita</i> (Valenciennes, 1840)              | 1      | 0,03          |
| <i>Mormyrus hasselquistii</i> (Valenciennes, 1849)          | 1      | 0,03          |
| <i>Hippopotamyrus paugyi</i> (Bigorne, 1985)                | 1      | 0,03          |
| <i>Schilbe intermedius</i> (R üppell, 1832)                 | 1      | 0,03          |
| <i>Siluranodon auritus</i> (Geoffroy -Saint-Hilaire, 1827)  | 1      | 0,03          |
| <i>Tetraodon lineatus</i> (Linnaeus, 1758)                  | 1      | 0,03          |
| 56                                                          | 3425   | 100           |

**Table 3.** The percentage of occurrence of fish species encountered at the Carri ère landing stage.

| Groups      | Number | Proportion of groups |
|-------------|--------|----------------------|
| Constants   | 28     | 50,00                |
| Accessories | 10     | 17,86                |
| Accidental  | 18     | 32,14                |
| Total       | 56     | 100                  |

### 3.3. Species Categories Based on Occurrence

The percentage of occurrence allowed us to group the fish into:

- constant fish in the catches represented by 28 species, or 50.00% (28/56), namely *Sarotherodon galilaeus*, *Coptodon zillii*, *Auchenoglanis biscutatus*, *Synodontis schall*, *Clarias anguillaris*, *Citharinus citharus*, *Labeo senegalensis*, *Mormyrus rume*, *Brycinus macrolepidotus*, *Heterotis nilot-*

*icus*, *Coptodon dageti*, *Lates niloticus*, *Chrysichthys auratus*, *Mormyrops anguilloides*, *Hemichromis fasciatus*, *Brycinus leuciscus*, *Bagrus bajad*, *Hydrocynus forskalii*, *Labeo coubie*, *Malapterurus electricus*, *Marcusenuis senegalensis*, *Schilbe mystus*, *Chrysichthys nigrodigitatus*, *Oreochromis niloticus*, *Synodontis membranaceus*, *Distichodus brevipinnis*, *Heterobranchus bidorsalis*, *Petrocephalus bane*.

- by-catch fish in the catches consisting of 10 species, or 17.86% (10/56), represented by *Campylomormyrus tamandua*, *Parailia pellicida*, *Synodontis clarias*, *Distichodus rostratus*, *Hydrocynus brevis*, *Bagrus docmak*, *Petrocephalus soudanensis*, *Brycinus nurse*, *Labeo roseopunctatus*, *Garra waterloti*.

- accidental fish in the catches including 18 species, or 32.14% (18/56), represented by *Hyperopisus bebe*, *Hemichromis bimaculatus*, *Barbus sp.*, *Alestes dentex*, *Heterobranchus longifilis*, *Gymnarchus niloticus*, *Hippopotamyrus paugyi*, *Marcusenuis cyprinoides*, *Polypterus senegalus*, *Mochokus niloticus*, *Synodontis batensoda*, *Barbus ablabes*, *Distichodus engycephalus*, *Synodontis nigrita*, *Mormyrus hasselquistii*, *Schilbe intermedius*, *Siluranodon auritus*, *Tetraodon lineatus*.

## 4. Discussion

The study showed that the fish harvested at the Carrière landing stage include 56 species spread across 35 genera and 17 families. These are fish belonging to the Nilo-Sudanian ichthyological region, the most represented families of which are Mormyridae, Cichlidae, Cyprinidae, Alestidae, Mochokidae. These results are consistent with the distribution of fish in the large West African basins [17, 15].

The ichthyological fauna exploited at the Carrière landing stage is identical to that encountered on other rivers in the Niger River basin [18, 19] and the Senegal River basin [20]. This fauna is also close to that reported in other rivers in West Africa, in Benin [21] in Ivory Coast [10, 22-24], in Niger [1] and in Burkina [2, 25]. The presence or absence of a species or family could be explained by the diversity of fishing gear used [10]. The most numerically abundant species in the catches were *Chrysichthys auratus*, *Sarotherodon galilaeus*, *Coptodon zillii*, *Auchenoglanis biscutatus*, *Brycinus leuciscus*, *Schilbe mystus*, *Bagrus bajad* and *Citharinus citharus* and could be the most vulnerable to the fishing gear used. For the first time, *Mochokus niloticus* was reported in the ichthyological fauna of Lake Sédingué.

Diversity is relatively high. Twenty-eight (28) exploited species, or 50% of catches, are constant. On the other hand, 32.14% of the species (18) are accidental in the captures including species with high market value such as *Heterobranchus longifilis*, *Gymnarchus niloticus*, *Distichodus engycephalus*, *Hyperopisus bebe*, *Alestes dentex*. Accidental species may be in sharp decline in the lake waters due to overfishing, unfavorable environmental conditions, or they may be in special habitats and escape fishing gear [26].

Among the 91 species reported by authors [7] at Lake Sédingué 53 species were recorded at the Carrière landing stage against 38 species not encountered. Apart from *Alestes baremoze*, *Synodontis filamentosus*, *Synodontis sores*, the other species are small fish such as *Micralestes elongatus*, *Chromidotilapia guntheri*, *Pellonula leonensis*, *Pellonula vorax*, *Barbus ssp*.

Three species encountered during our study, namely, *Mochokus niloticus*, *Marcusenuis cyprinoides*, *Barbus sp*, were not reported by authors [7].

## 5. Conclusion

The Carrière landing stage boasts a rich fish fauna, with 56 exploited species belonging to 35 genera and 17 families, with a regular distribution of fish in the catches. Constant species in the catches represent 50%. Among the incidental species are high-value species. *Chrysichthys auratus*, *Sarotherodon galilaeus*, *Coptodon zillii*, *Auchenoglanis biscutatus*, *Brycinus leuciscus*, *Schilbe mystus*, *Bagrus bajad* and *Citharinus citharus* accounted for 71.92% of the catches. Two new species, *Mochokus niloticus* and *Marcusenuis cyprinoides*, have been formally identified for the first time in the Sédingué Lake area. The Sédingué dam lake still constitutes an important area for supplying urban centers with fresh fish. Monitoring and control of fish landings should be strengthened to reduce fishing pressure. The Selingue Lake area could be considered an area of excellence for research and conservation of fish fauna in Mali.

## Abbreviations

|       |                                                         |
|-------|---------------------------------------------------------|
| D.N.P | National Directorate of Fisheries                       |
| F.A.O | Food and Agriculture Organization of the United Nations |

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## Conflicts of Interest

The authors declare no conflicts of interest.

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