ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 12, Issue, 12, pp.15393-15400, December, 2020

DOI: https://doi.org/10.24941/ijcr.40502.12.2020

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

ICHTHYOFAUNA DIVERSITY IN RAINY AND DRY SEASONS IN THE UPPER MOUHOUN RIVER BASIN IN BURKINA FASO

COMPAORE Inoussa*[1], SANOGO Souleymane[1], TANKOANO Boalidioa[3], TAMA Kouakou[1], NACRO B. Hassan[2] and KABRE T. André[1]

[1]Laboratoire de Recherche et de Formation en Pêche et Faune (LaRFPF)/Université Nazi BONI- 01 BP 1091 Bobo-Dioulasso 01, Burkina Faso; [2]Laboratoire d'étude et de recherche sur la fertilité du sol (LERF)/Université Nazi BONI-01 BP 1091 Bobo-Dioulasso 01, Burkina Faso; [3]Laboratoire SyNAIE (Système Naturel Agrosystème et de l'Ingénierie de l'Environnement) Université Nazi BONI-01 BP 1091 Bobo-Dioulasso 01, Burkina Faso

ARTICLE INFO

Article History:
Received 20th September, 2020
Received in revised form
27th October, 2020
Accepted 15th November, 2020
Published online 30th December, 2020

Key Words:
Specific Richness, Diversity Index, Rainy Season, Dry Season, Upper Mouhoun, Burkina Faso.

ABSTRACT

The knowledge of the ichthyofauna remains an advantage and a privileged tool for a sustainable management of the fishery. The present study was carried out in three fisheries located in the upper basin of the Mouhoun River in Burkina Faso. The objective was to make a comparative study of the richness of the ichthyofauna present in the three fisheries during the rainy and dry seasons. Therefore, the sampling of fish was done on the basis of the daily catches of the fishermen. A total of 50 fishermen were selected, of which 30 in Samendeni, 10 in Balla and 10 in Bama.In all three fisheries 43 species distributed in 31 genera and 18 families were identified. The most representative families are:*Cichlidae* (66%), *Osteoglossidae* (9%), *Claroteidae* (5%), *Mochokidae* (4%) and *Gymnarchidae* (4%). The Samendeni fishery has the highest fish diversity followed by Balla and Bama with 34, 24 and 22 species respectively. The Kruskal Wally test shows that there is no significant difference (p-value=0.763) in terms of number of species between the dry and wet seasons. The p-values of the Chi-square test calculated give for the Shannon index 0.3608; Simpson's index 0.5577 and the Equitability index 0.5617 and show that there is no statistically significant difference in these indices between the two seasons. This study has shown that the upper Mouhoun basin contains a strong ichthyological diversity and that it is necessary to exploit it in a rational and sustainable way for the benefit of the communities.

Citation: *COMPAORE Inoussa, SANOGO Souleymane, TANKOANO Boalidioa, TAMA Kouakou, NACRO B. Hassan and KABRE T. André.* **2020.** "Ichthyofauna diversity in rainy and dry seasons in the upper mouhoun river basin in Burkina Faso", *International Journal of Current Research*, 12, (12), 15393-15400.

INTRODUCTION

Knowledge of the fish fauna has long since aroused the interest of scientists (Eyi *et al*., 2016). Thus, in Burkina Faso, Roman's work (1966) identified 121 species of fish divided into 59 genera and 24 families throughout the Volta catchment area. Following this study, other, but non-exhaustive, studies have been carried out in recent decades in certain river basins, notably the work of Sirima *et al* (2009) on the Comoe basin; that of (Sanon, 1995; Kouesse, 2010 unpublished data) on the Mouhoun basin and that of Ouédraogo *et al*. (2015) in Lake Higa (Niger basin in the Sahel). While this work has been carried out, it should be noted that very little attention has been paid to the distribution of species according to seasonal variation (rainy and dry season) in Burkina Faso. However, the work of Lalèyè *et al*. (2004) and Sarr *et al*. (2018) has shown that there is a distribution of fish species according to the seasons. However, it appears that the control of the factors conditioning the distribution and dynamics of stands is necessary for decision-making for sustainable management of fishery resources (Nasser, 1999). It is in this context that this study was carried out with the objective of determining the diversity of the ichthyofauna during the rainy and dry seasons of three fisheries located in the Upper Mouhoun watershed in Burkina Faso. These are the Bama, Balla and Samendeni fisheries which has just been impounded in 2018. These fisheries are subject to strong anthropic pressure due to agricultural activities through the use of inputs (pesticides, teak herbicides) but also to an intense exploitation of fishery resources in view of the increasing number of fishermen. In the interest of good sustainable management of the fisheries in these bodies of water, it is imperative to proceed with a characterization of the Ichthyoan diversity in order to follow its evolution over time.

Corresponding author: **COMPAORE Inoussa**
Laboratoire de Recherche et de Formation en Pêche et Faune (LaRFPF)/Université Nazi BONI- 01 BP 1091 Bobo-Dioulasso 01, Burkina Faso

MATERIALS AND METHODS

Study area: The study area is located in the upper basin of the Mouhoun River, west of Burkina Faso. The study was carried out on three fisheries that straddle the commune of Bama and

Satiri. These are the Samendeni fishery, the Bama fishery and the Balla fishery. Figure 1 shows the geographical location of these three fisheries.

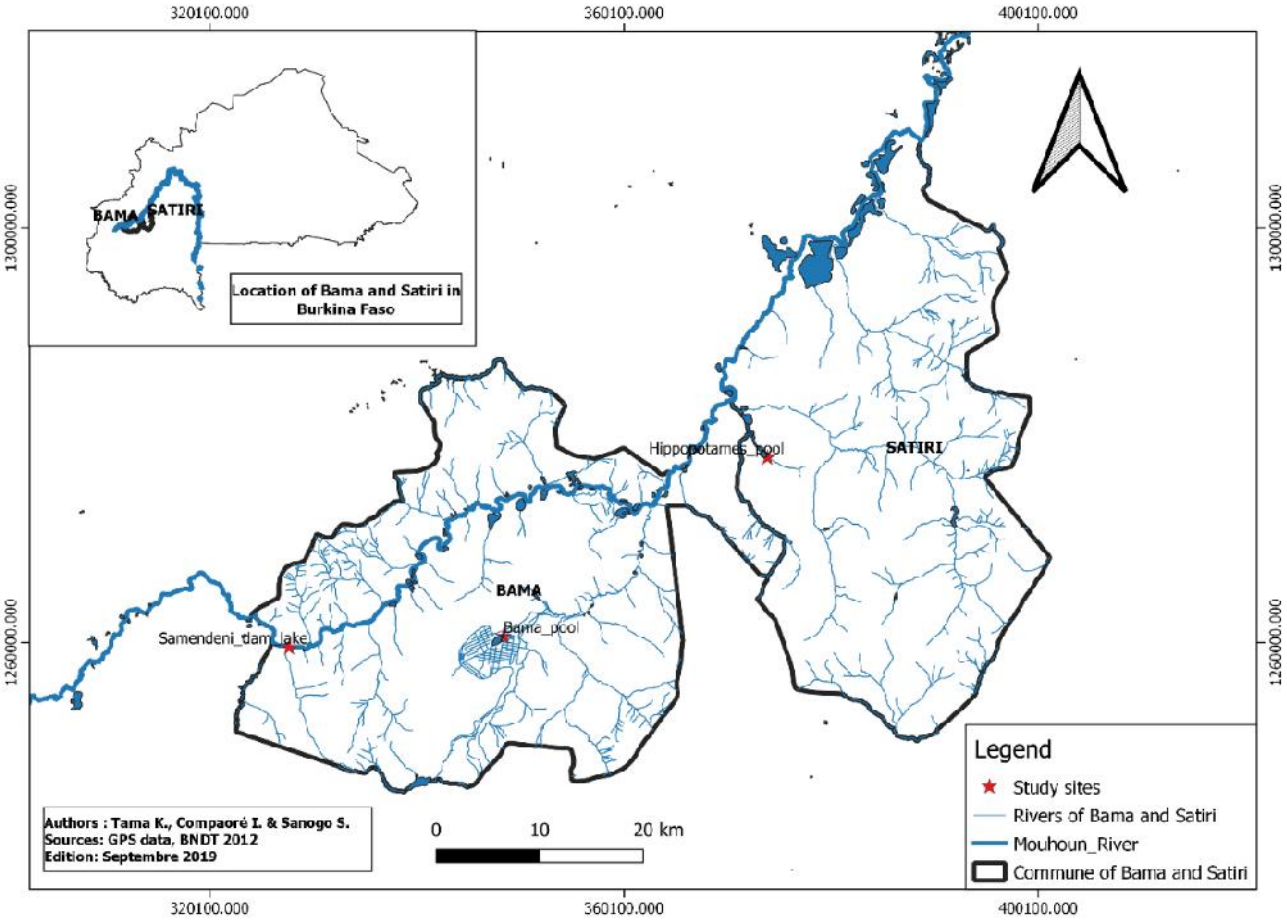

Figure 1. Geographic location of the three fisheries

Technical equipment: The fishing gear used during this study for the capture of fish is composed of a battery of gillnets, hawks nets, longlines and traps. The identification of the sampled fish was based on the identification keys Paugy and *al*. (2003a); Paugy and *al*. (2003b). Three electronic scales of different calibers were used to catch the weights of the sampled fish. An ichthyometer and a calliper (200 ± 0.2 mm) were used to catch the lengths (standard and total).

METHODS

Fish sampling: Data collection was carried out in two periods: the first period corresponding to the period of the rainy season (July to August 2018) and the second period corresponding to the dry season (February to April 2019) on each fishery. On the three sites, 5 fishing camps were selected, 3 of which were in the Samendeni fishery because of its size and 1 camp in each of the other two fisheries (Bama and Balla). This approach was valid for both periods (rainy season and dry season). On each camp, we chose 10 volunteer fishermen for the monitoring and identification of the species caught, i.e. 50 fishermen for all 3 sites. For each fisher, 1 to 30 individuals of each fish species were selected for the study at each trip. Each individual was identified, followed by measurements of total length (Lt) and standard length (Lst) as well as total weight catch (WT).

Measured parameters: The different parameters assessed to account for diversity and abundance at the three sites are as follows:

- the global and specific taxonomic richness for each site and according to the season,
- the specific contribution (SC), which is defined as the ratio of the specific frequency to the sum of the frequencies of all species surveyed. This is a relative frequency.

Its formula is as follows: $C = \left(\frac{F}{\sum_i^n F}\right) * 1$

With n the number of individuals of species i,
CSi the contribution of species i,
FSi, the specific frequency of the species i.

- Specific diversity. The evaluation of specific diversity required the use of several indices which are :

The Shannon Index (H)

The specific diversity index (H) called Shannon's index (H) represents the specific diversity of a medium. Its formula is: $H = -\sum pi * \log_2(pi)$

With pi = ni/N. N being the total sum of the numbers (individuals) obtained for all species; ni, the number of individuals per species and pi the relative abundance of species i in the sample. For Dajoz (1984), this index is independent of sample size and takes distribution into account. When H = 0 all individuals belong to the same species; H < 1.5 the stand under study is poorly diversified and H > 1.5 the stand studied is diversified.

Piélou's Fairness Index

It is defined as the ratio of actual diversity to maximum diversity and is calculated by the following formula: $E = \frac{H}{\log_2 S}$ with H the diversity of Shannon and S is the species richness (number of species). This index varies from 0 to 1. When it tends towards 0 (E < 0.5), it means that almost all of the population tends to be concentrated in a single species. It is equal to 1 when all species have the same abundance (Barbault, 1981).

Simpson's Diversity Index (DSi): The Simpson's Diversity Index (DSi) is between 0 and 1 and will have a value of 0 to indicate maximum diversity, and a value of 1 to indicate minimum diversity. The formula to calculate this index is as follows: $DSi = 1 - \sum_{i-1}^{S} Pi^2$

With Pi: the species-specific frequency and S: the number of species.

Chao Estimator: Chao (1984) estimates the number of unobserved species from those observed once or twice. This is a minimum estimator, valid as long as singletons and doublets account for a significant part of the information. It is calculated as follows: $\hat{S}chao1 = \hat{S}^{\geq 1} + \frac{(\hat{S}^1)^2}{2\hat{S}^2}$

With :$\hat{\mathbf{S}}^{\geq 1}$is the number of different species observed, and $\hat{\mathbf{S}}^{\mathbf{1}}$ forecast of unobserved species.

The sample can be an area or a number of individuals. If no species is observed twice, the estimator is replaced by: $\hat{S}chao1 = \hat{S}^{\geq 1} + \frac{\hat{S}^1(\hat{S}^1-1)}{2}$(Chao, 2004). We have chosen this estimator because it allows us to make a prediction on the number of species that the studied habitat may harbour.

RESULTS

Overall taxonomic richness in the three fisheries: At the end of this study, 43 species were identified in 31 genera belonging to 18 families.

Table 1. List of the main species encountered in the three fisheries during the dry and wet seasons

Families	Scientific names	Bama		Balla		Samendeni	
		RS	DS	RS	DS	RS	DS
Claroteidae	*Auchenoglanis occidentalis (Valenciennes, 1840)*	*		*	*	*	*
	Chrysichthysauratus (Geoffroy St-Hilaire, 1808)					*	*
Bagridae	*Bagrusbajad (Forsskäll, 1775)*			*		*	*
	Bagrusdocmack (Forsskäll, 1775)						*
Alestidae	*Alestes baremoze (de Joannis, 1835)*					*	*
	Brycinus nurse (Rüppell, 1832)	*	*	*	*	*	*
Clariidae	*Heterobranchisbidorsalis (Geoffroy St-Hilaire, 1809)*			*			
	Clarias sp	*	*	*	*	*	*
Anabantidae	*Ctenopomakingsleyae (Günther, 1896)*	*	*				
	Ctenopomapetherici (Günther, 1864)	*	*		*		
Gymnarchidae	*Gymnarchusniloticus(Cuvier, 1829)*	*	*	*	*		*
Osteoglossidae	*Heterotisniloticus(Cuvier, 1829)*	*	*	*	*	*	*
Cichlidae	*Coptodonzillii (Gervais, 1848)*	*	*	*	*	*	*
	Chromidotilapiaguntheri (Sauvage, 1882)					*	*
	Hemichromisbimaculatus (Gill, 1862)	*	*	*	*	*	
	Hemichromisfasciatus (Peters, 1857)	*	*	*	*	*	*
	Oreochromisniloticus (Linnaeus, 1758)	*	*	*	*	*	*
	Sarotherodongalilaeus (Linnaeus, 1758)	*	*	*	*	*	*
Cyprinidae	*Labeocoubie (Rüppell, 1832)*				*	*	*
Latidae	*Latesniloticus (Linnaeus, 1762)*					*	*
Malapteruridae	*Malapteruruselectricus (Gmelin, 1789)*					*	*
Mormyridae	*Hippopotamyruspictus (Marcusen, 1864)*	*					
	Hyperopisusbebe (Lacépède, 1803)					*	*
	Marcuseniussenegalensis (Steindachner, 1870)	*	*	*	*	*	*
	Mormyropsanguilloides (Linné, 1758)						*
	Mormyrusrume (Valenciennes, 1846)					*	*
	Petrocephalusbovei (Valenciennes, 1846)				*		
Channidae	*Parachannaobscura (Günther, 1861)*	*	*	*	*	*	
Polypteridae	*Polypterusansorgii (Boulenger, 191O)*			*			
	PolypterusbichirLapradei (Steindachner, 1869)		*	*	*		
	Polypterusendlicheriendlicheri (Heckel, 1849)			*	*		*
	Polypterussenegalussenegalus (Cuvier, 1829)	*	*		*		
Protopteridae	*Protopterusannectens (Owen, 1839)*	*				*	
Schilbeidae	*Schilbeintermedius (Rüppell, 1832)*	*	*	*	*	*	*
Mochokidae	*Hemisynodontismembranaceus (Geoffroy St-Hilaire, 1809)*				*	*	
	Synodontis clarias (Linné, 1758)					*	*
	Synodontisnigrita (Valenciennes, 1840)	*	*	*	*	*	
	Synodontisocellifer (Boulenger, 1900)					*	
	Synodontisschall (Bloch et Schneider, 1801)	*	*			*	*
	Synodontispunctifer (Daget, 1964)					*	*
	Synodontisbatensoda (Rüppell, 1832)					*	
	Synodontisvélifer (Norman, 1935)	*					
Tetraodontidae	*Tetraodonlineatus (Linné, 1758)*						*
18 Families	43 species	21	18	19	21	29	27

Legend: (*) = presence; RS = rainy season; DS = dry season

At the level of the Bama fishery, a total of 22 species in 17 genera and 13 families were counted. In Balla, a total of 24 species in 19 genera and 14 families and in Samendeni, 34 species in 24 genera and 17 families (Table I).

other families with one species. The most represented families in the rainy season are the families *Mochokidae* (7 species), *Cichlidae* (6 species), *Mormyridae* (3 species). In the dry season, the families *Cichlidae* (5 species), *Mochokidae* (3

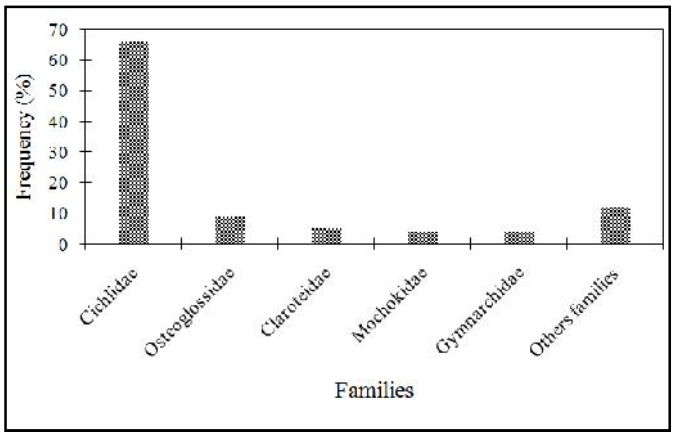

Figure 2. List of the most abundant families in the 3 fisheries

Table 2. Number of species per family by site and season

Families	Bama		Balla		Samendeni Dam	
	RS	DS	RS	DS	RS	DS
Claroteidae	1	0	1	1	2	2
Bagridae	0	0	1	0	1	2
Alestidae	1	1	1	1	2	2
Clariidae	1	1	2	1	1	1
Anabantidae	2	2	0	1	0	0
Gymnarchidae	1	1	1	1	0	1
Osteoglossidae	1	1	1	1	1	1
Cichlidae	5	5	5	5	6	5
Cyprinidae	0	0	0	1	1	1
Latidae	0	0	0	0	1	1
Malapteruridae	0	0	0	0	1	1
Mormyridae	2	1	1	2	3	4
Channidae	1	1	1	1	1	0
Polypteridae	1	2	3	3	0	1
Protopteridae	1	0	0	0	1	0
Schilbeidae	1	1	1	1	1	1
Mochokidae	3	2	3	3	7	3
Tetraodontidae	0	0	0	0	0	1
Total by season	21	18	21	22	29	27
Total by site	22		24		34	

Legend: RS = Rainy Season; DS = Dry Season

Specific richness by fishery and season: The specific richness in the three fisheries is 22, 24 and 34 species respectively for Bama, Bala and Samendeni. In the Bama fishery, there are 13 families in both seasons of which the most represented in number of species are: *Cichlidae* (5 species), *Mochokidae* (3 species), *Mormyridae* (2 species), *Polypteridae*(2 species), *Anabantidae* (2 species) and other families with one species. In the rainy season, the most represented families are the *Cichlidae* (5 species) and the *Mochokidae* (3 species). On the other hand, in the dry season, the *Cichlidae* family is the most represented with 5 species and the other families with at most 2 species (Table II). In the Balla fishery, there are 14 families with the most represented in number of species in both seasons, including *Cichlidae* (5 species), *Polypteridae* (4 species), *Mochokidae* (2 species), *Mormyridae* (2 species), *Clariidae* (2 species) and the other families with one species. In the rainy season, the families *Cichlidae* (5 species), *Mochokidae* (3 species) and *Polypteridae* (3 species) are the most represented. The same trend was observed in the dry season (Table II). As regards the Samendeni fishery, 17 families were recorded. These are *Mochokidae* (7 species), *Cichlidae* (6 species), *Mormyridae* (4 species), *Claroteidae* (2 species), *Alestidae* (2 species) and

species), *Mormyridae* (4 species) are the most represented (Table II). On all the sites the Kruskal Wallis test shows that there is no significant difference (*p-value* = 0.763) between the number of species in the dry and wet season.

Specific contribution of species by season: The specific contribution varies from one species to another and from one fishery to another (Table III). In the Bama fishery, two species had the highest specific contributions (SC) (>10%) in both seasons. The first is *S. galilaeus*, which contributes 41.59% and 31.4% in the wet and dry seasons, respectively. Next *O. niloticus* contributes 27.31% in the wet season and 40.78% in the dry season. In the Balla fishery, *S. galilaeus* (37%) and *H. niloticus* (30.68%) had the highest specific contributions (>10%) in the wet season. In the dry season, *S. galilaeus*, *O. niloticus* and *H. niloticus* had the highest specific contributions with respective values of 37.87%, 21.37% and 14.95%. In the Samendeni fishery, four species, *S. schall*; *A. occidentalis*; *O. niloticus* and *S. galilaeus*, had the highest specific contributions with respective values of 15.8%; 15.2%; 14.42% and 12.02% in the rainy season. On the other hand, in the dry season, species with a specific contribution greater than 10% were *C. zillii* (35.62%) followed by *S. galilaeus* (27.84%) and *O. niloticus* (15.95%).

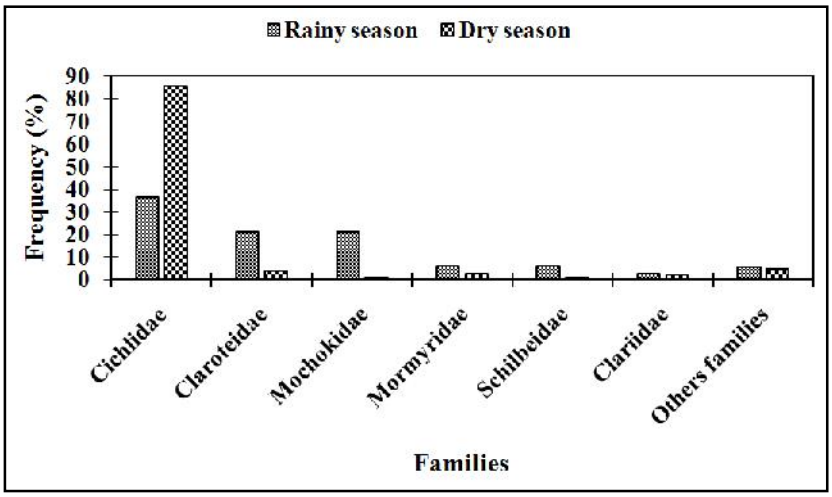

Figure 3. Specific contribution of families by season in the Samendeni fishery

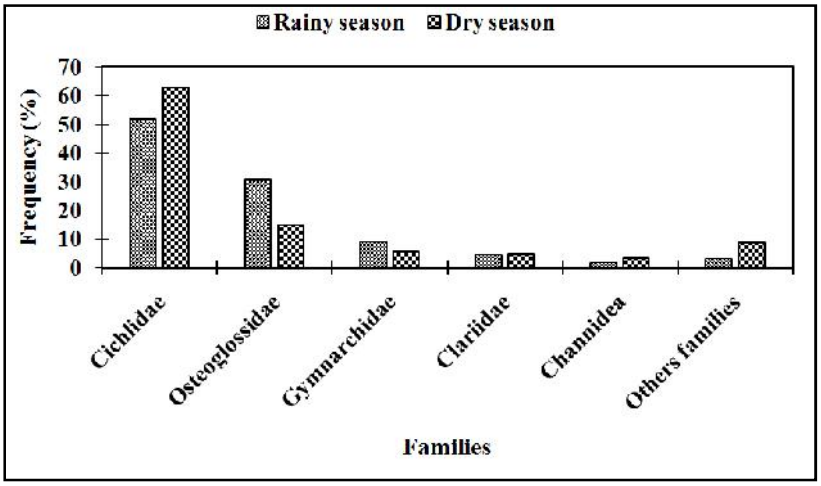

Figure 4. Specific contribution of families by season in the Balla fishery

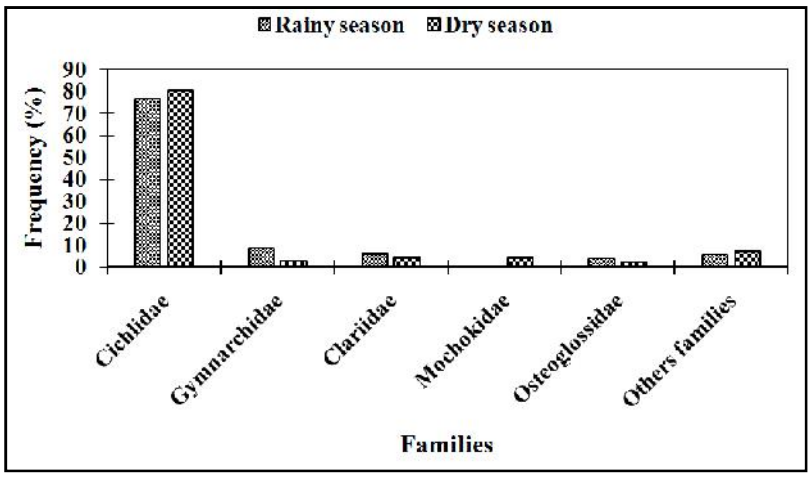

Figure 5. Specific contribution of families by season in the Bama fishery

Shannon, Simpson's Diversity Index and Pielou's Equitability Index: Diversity index values vary from season to season and from fishery to fishery (Table IV). The Shannon index is 1.73; 1.74 and 2.56 respectively for the Bama, Balla and Samendeni fisheries in the rainy season. In the dry season, it is 1.85 for the Samendeni fishery; 1.95 for the Balla fishery and 1.76 for the Bama fishery. This index reveals that in the rainy season, the Samendeni fishery is the most diversified followed by the Balla fishery.

On the other hand, in the dry season, the Balla fishery is the most diversified followed by the Samendeni Dam. The Simpson's index varies respectively from 0.74, 0.75 and 0.91 for the Bama, Balla and Samendeni fisheries in the wet season. In the dry season, the Balla fishery has the highest value followed by the Samendeni Dam and the Bama fishery with 0.78, 0.77 and 0.73 respectively. The high values of this index in three study sites testify to the high fish diversity in these ecosystems.

The Equitability Index of Piélou calculated in the rainy season is 0.44 for the Samendeni fishery; 0.30 for the Balla fishery and 0.27 for the Bama fishery. It is 0.23 for the Dam, 0.34 for the Balla fishery and 0.32 for the Bama fishery in the dry season. The low values of the equitability index show that almost all the numbers tend to concentrate on one or two species in each site depending on the season. Nevertheless, these differences observed at the level of the three plans are not statistically significant. Indeed, a chi-square performed on these three indices gives values of 0.3608 for the Shannon index, 0.5577 for the Simpson index and 0.5617 for the Piélou equitability index.

Table 3. Specific contribution of species by fishery and season

Sites	Bama		Balla		Samendeni	
Seasons	RS	DS	RS	RS	RS	RS
species	CS (%)	CS (%)	CS (%)	CS (%)	CS (%)	CS (%)
Alestes baremoze	-	-	-	-	0,06	0,38
Auchenoglanis occidentalis	0,3	-	0,78	2,55	15,2	1,62
Bagrusbajad	-	-	0,09	-	0,9	0,76
Bagrusdocmak	-	-	-	-	-	0,05
Brycinus nurse	0,15	0,65	0,35	0,89	1,44	0,49
Chromidotilapiaguntheri	-	-	-	-	0,06	0,27
Chrysichthysauratus	-	-	-	-	6,01	2,22
Clarias sp	5,73	4,32	4,16	4,76	2,46	2,16
Coptodonzillii	6,47	5,46	1,73	2,21	8,11	35,62
Ctenopomakingsleyae	0,37	0,49	-	-	-	-
Ctenopomapetherici	0,45	0,24	-	0,89	-	-
Gymnarchusniloticus	8,26	2,53	8,84	5,54	-	0,05
Hemichromisbimaculatus	0,3	0,9	0,61	0,55	0,36	-
Hemichromisfasciatus	0,6	1,55	2,95	0,78	1,56	5,62
Hemisynodontismembranaceus	-	-	-	0,22	0,06	-
Heterobranchisbidorsalis	-	-	0,09	-	-	-
Heterotisniloticus	3,72	2,04	30,68	14,95	0,12	0,05
Hippopotamyruspictus	0,52	-	-	-	-	-
Hyperopisusbebe	-	-	-	-	1,26	0,81
Labeocoubie	-	-	-	0,11	1,5	0,49
Latesniloticus	-	-	-	-	0,78	1,89
Malapteruruselectricus	-	-	-	-	0,42	0,27
Marcuseniussenegalensis	0,37	0,82	0,09	0,66	4,99	0,16
Mormyropsanguilloides	-	-	-	-	-	0,05
Mormyrusrume	-	-	-	-	1,2	1,24
Oreochromisniloticus	27,31	40,78	9,36	21,37	14,42	15,95
Parachannaobscura	2,31	0,65	1,65	3,21	0,06	-
Petrocephalusbovei	-	-	-	0,55	-	-
Polypterusansorgii	-	-	0,26	-	-	-
PolypterusbichirLapradei	-	1,55	0,52	0,22	-	-
Polypterusendlicheri	-	-	0,69	0,44	-	0,05
Polypterussenegalus	0,07	1,47	-	0,89	-	-
Protopterusannectens	0,89	-	-	-	0,06	0,05
Sarotherodongalilaeus	41,59	31,4	37	37,87	12,02	27,84
Schilbeintermedius	0,15	1,14	0,09	0,55	5,83	0,92
Synodontisbatensoda	-	-	-	-	0,06	-
Synodontis clarias	-	-	-	-	0,96	0,16
Synodontisnigrita	0,07	3,83	0,09	0,78	0,72	-
Synodontisocellifer	-	-	-	-	0,36	-
Synodontispunctifer	-	-	-	-	3,19	0,11
Synodontisschall	0,22	0,16	-	-	15,8	0,65
Synodontisvelifer	0,15	-	-	-	-	-
Tetraodonlineatus	-	-	-	-	-	0,05

Legend: RS = Rainy Season; DS = Dry Season

Table 4. Summary table of the diversity indices calculated according to the season for the 3 study sites

Sites	Seasons	Shannon Index (H')	Simpson Index (1-D)	Piélou equitability Index
Bama	Rainyseason	1,73	0,74	0,27
	Dry season	1,76	0,73	0,32
Balla	Rainyseason	1,74	0,75	0,3
	Dry season	1,95	0,78	0,34
Samendeni	Rainyseason	2,56	0,9	0,44
	Dry season	1,85	0,77	0,23

Table 5. Summary table of the Chao 1 estimator

Sites	Bama	Balla	Samendeni
Minimum	22	24	33
Maximum	23	30	52

DISCUSSION

The present study carried out in the upper Mouhoun River in Burkina Faso revealed the presence of 43 species of fish divided into 31 genera and 18 families. The ichthyological fauna encountered consists mainly of *Cichlidae*; *Osteoglossidae*; *Clariidae; Gymnarchidae; Mochokidae; Mormyridae; Claroteidae* and other families such as*: Polypteridae; Protopteridae; Cyprinidae; Channidae; Anabantidae* (etc.). This is similar to the composition and distribution of fish fauna in African rivers (Paugy, 1994; Lévêque and Paugy, 2006; Kantoussan, 2007). The fish species inventoried are already reported in the Mouhoun River basin (Daget, 1960; Roman, 1966; Ouedraogo, 1994; Sanon, 1995; Kouesse, 2010). This part of the Mouhoun River reveals a high fish diversity as work carried out on other bodies of water has shown almost similar fish diversity, notably that of Kuela (2002) and Sirima *et al*. (2009) in the Burkinabe part of the Comoe River. The work of Kuela (2002) and Sirima *et al*. (2009) identified 40 and 38 species respectively. However, the work of Ouédraogo *et al*. (2015a) carried out on Lake Higa in Burkina Faso, one of the tributaries of the Niger River, identified 18 species. From these studies, it appears that the Burkinabe part of the Mouhoun and Comoe rivers are richer in fish fauna than the Burkinabe part of the Niger River. Also, the families most represented in number of species in our study are the *Mochokidae* with 8 species, followed by the *Cichlidae* family with 6 species, the *Mormyridae* family with 6 species and the *Polypteridae* family with 4 species. From the point of view of abundance, the most abundant families are *Cichlidae*(66%), Osteoglossidae (9%), Claroteidae (5%) followed by *Mochokidae* (4%) and *Gymnarchidae* (4%). The abundance of *Cichlidae* in Burkina water bodies has been confirmed by several studies in particular (Ouédraogo *et al*., 2015a and 2015b; Sirima *et al*., 2009; Kouesse, 2010, Sanon 1995).

During the catches, the most abundant species varied from one site to another and also from one season to another, but with regard to the results, it will be very difficult to say which species are predominant according to the season because the values are very random. At the Bama and Balla sites, the most abundant species are *S. galilaeus*, and *O. niloticus*. On the other hand at Samendeni, the most abundant species in the catches are *C. zillii*, *O. niloticus*, and *S. galilaeus*. These results are similar to those of Sirima *et al*, (2009), Ouattara *et al*, (2020). These species belong to the family *Cichlidae* and form the basis of fishermen's sources of income (Ouattara *et al*, 2020). This abundance of *Cichlidae* in Burkina water bodies has been confirmed by several studies in particular (Ouédraogo *et al*., 2015; Sirima *et al*., 2009). It is in fact a characteristic fauna of West African rivers (Lévêque *et al*., 1990-1992; Paugy, 1994; Paugy *et al*., 2003a-2003b; Lévêque and Paugy, 2006). Species of this family have great potential to adapt to almost all aquatic environments and generally have a fairly short reproductive cycle, which enables them to colonise the environments in which they are found fairly easily (Baijot *et al*., 1994). The analysis of the diversity through the different indices reveals a great diversity of the upper Volta watershed. Considering the Shannon index (H), we can say that among the three sites, the Samendeni fishery is the most diversified followed by the Balla fishery and the Bama fishery. According to the work of Dajoz (1984) and Margurran (1988), Shannon index values above 1.5 reveal a high fish diversity. As a result, the study sites abound with a high fish diversity. Concerning the sites, the greater diversity observed in the Samendeni fishery could be explained by its larger size compared to the other two sites and by the fact that it is constructed on the main bed of the Volta River since according to Sarrand al, (2018) the probability of catching an additional species increases with the surface area of the area explored, the type of gear used with the number of samples taken. However, the very low values of the Piélou Equitability Index (E<0.5) reveal in fact that the three water bodies are strongly disturbed by both anthropogenic activities and environmental factors. The calculated Chao 1 estimator gives an estimate of the number of species that could be in a given ecosystem. This estimator reveals that the entire ichthyofauna was not encountered in the three study sites. The results of this estimator could prove to be true since the work of Kouesse (2010) and Sanon (1995) had identified more species than the present study in the Bama and Balla fisheries. It is therefore possible that the species reported by the fishermen and not encountered during our work are rare or endangered species in these bodies of water.

Conclusion

In the upper watershed of the Mouhoun River in Burkina Faso, the fish fauna is diverse. The families *Cichlidae, Claroteidae, Osteoglossidae, Gymnarchidae and Mochokidae* are the most represented in the three water bodies in terms of abundance. At the Samendeni Dam, the families *Cichlidae, Claroteidae* and *Mochokidae* are the most dominant in the catches. In the Balla fishery, the families *Cichlidae*, *Osteoglossidae* and *Gymnarchidae* dominate the catches. In the Bama fishery, the families *Cichlidae* and *Gymnarchidae* dominate the catches. In terms of fish diversity, the Samendeni fishery is the most diversified with 34 species, followed by the Balla fishery with 24 species and the Bama fishery with 22 species.

REFERENCES

Barbault C., 1981. Écologie des populations et des peuplements. *Éd.Masson*, Paris, 200 p.

Dajoz R., 1984. Les coléoptères ténébrionidés des déserts. *Cahiers des* Naturalistes. 40 :25-67.

Eyi J. A., Konan J. K., Tano K., N'da K., et Atse B. C.,2016. Étude préliminaire des communautés ichtyofauniques de la lagune Ono (Côte d'Ivoire). *Journal of Applied Biosciences* 104:9894-9903.

Kouesse R. K., 2010. Étude de la diversité ichtyologique et des modes d'exploitation dans le fleuve Mouhoun au Burkina Faso. Institut du Développement rural, mémoire de fin de cycle d'ingénieur, Université Polytechnique de Bobo-Dioulasso, 57p.

Lévêque C., et Paugy D., 1999. Caractéristiques générales de la faune ichtyologique. *In* : Les Poissons des Eaux continentales africaines. *Diversité, écologie, utilisation par l'Homme*. IRD: Paris, France ; pp 43-53.

Lévêque C., et Paugy D., 2006. Distribution géographique et affinités des poissons d'eau douce africains, *In :* C. Lévêque et D. Paugy (Eds.). Les poissons des eaux continentales. Diversité, écologie, utilisation par l'homme. Editions *Institut de Recherche pour le Développement*, Paris, pp 59 - 74.

Lévêque C., Oberdorff T., Paugy D., Stiassny M. L. J., et Tedeco P. A., 2008.Global diversity of fish (Pisces) in freshwater. *Hydrobiologia 595:* 545–567.

Lévêque C., Paugy D., et Teugels G. G., 1992. Faune des poissons d'eaux douces et saumâtres de l'Afrique de l'Ouest. Tome 2. Édit. ORSTOM. 521 p.

Lévêque C., Paugy D., etTeugels G. G., 1990. Faune des poissons d'eaux douces et saumâtres de l'Afrique de l'Ouest. Tome 1. Édit. ORSTOM. 386 p.

Lorenzo J.M., Pajuelo J.G., Mendez-Villamil M., Coca J., Ramos A.G., 2002. Age, growth, reproduction and mortality of the striped seabream, *Lithognathusmormyrus* (Pisces, Sparidae), off the Canary Islands (Central-east Atlantic). *J. Appl. Ichthyol*., 18: 204-209.

Magurran A. E., 1988. Ecological diversity and its measurement. Princeton University Press, Price ton, New Jersey, 197 p.

Nasser A. K. V., 1999. Length–weight relationships of tuna baitfish from the Lakshadweep Islands, India. *Naga, ICLARM Q*., 22: 42–44.

Ouedraogo R., Soara A. E., et Oueda A., 2015. Description du peuplement piscicole du lac sahélien de Higa, un site Ramsar du Burkina Faso, Afrique de l'Ouest. *Journal of Applied Biosciences 95: 8958-8965 (*www.m.elewa.org).

Paugy D., 1994.Écologie des poissons tropicaux d'un cours d'eau temporaire (Baoulé, haut bassin du Sénégal au Mali) : adaptation au milieu et plasticité du régime alimentaire. *Revue HydrobiologieTropicale. 27 (2):* 157 - 172.

Paugy D., 2010. An historical review of African freshwater ichthyology. *Freshwaterreviews 3*, PP 1-32.

Paugy D., Lévêque C., et Teugels G.G., 2003a. Faune des Poissons d'Eaux douces et saumâtres de l'Afrique de l'Ouest. Paris: Institut de recherche pour le développement & Muséum national d'histoire naturelle ; Tervuren: Musée royal de l'Afrique centrale. Vol. 1. 457 p.

Paugy D., Lévêque C., et Teugels G.G., 2003b. Faune des Poissons d'Eaux douces et saumâtres de l'Afrique de l'Ouest. Paris: Institut de recherche pour le développement & Muséum national d'histoire naturelle ; Tervuren: Musée royal de l'Afrique centrale. Vol. 2. 815 p.

Pielou E. C., 1966. The measurement of diversity in different types of biological collections. *Journal of TheoreticalBiology, 13:* 131-144.

Rocklin D., 2003. Étude comparative de différents indices de diversité (indice de Shannon, indices taxonomiques) sur les peuplements de poissons lagunaires. Université de Montpellier II Sciences et Techniques du Languedoc ; Maîtrise de Biologie des Populations et des Écosystèmes. 47 p.

Sanon Z. L., 1995. Inventaire et dynamique de quelques espèces des poissons de la réserve de la biosphère de la pêcherie aux hippopotames et dans le lac de la vallée du Kou. Mémoire de fin de cycle d'ingénieur, Institut du Développement rural, GPSO.IRBET ; Ouagadougou. 59 p.

SarrS. M., NdiayeM., FayeE., et Diedhiou D. K., 2018. « Richesse spécifique et abondance du peuplement ichtyologique de l'Aire Marine Protégée de Joal-Fadiouth au Sénégal », VertigO - la revue électronique en sciences de l'environnement 18 (1) mise en ligne 25 mai 2018, consulté le 03 février 2019, 46 p. URL : http://journals.openedition.org/vertigo/20063.

Simpson E. H., 1949: Measurement of diversity. *Nature*, 163: doi:10.1038/163688a0.

Sirima O., Toguyeni A., Kabore-Zoungrana Y.C., 2009. Faune piscicole du bassin de la Comoe et paramètres de croissance de quelques espèces d'intérêt économique.*Int. J. Biol. Chem. Sci. 3(1):* 95-106.

****