



## **Fish Species Composition and Morphological Descriptions of Five Dominant Families from Inland Waters of Kebbi State-Nigeria**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Authors DYB and SMNA designed the study, performed the statistical analysis and wrote the first draft of the manuscript. Authors ABA and FMY managed the analyses of the study. Author LAA managed the literature searches. All authors read and approved the final manuscript.*

### **Article Information**

DOI: 10.9734/AJFAR/2019/v3i1130024

#### **Editor(s):**

(1) Forcep Rio Indaryanto, Lecturer, Department of Fisheries, University of Sultan Ageng Tritayasa, Indonesia.

#### **Reviewers:**

(1) Ali Türker, Mugla Sıtkı Kocman University, Turkey.

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(3) Theodoros Mavraganis, Holar University College, Iceland.

Complete Peer review History: <http://www.sdiarticle3.com/review-history/47271>

**Received 19 December 2018**

**Accepted 08 March 2019**

**Published 30 March 2019**

**Original Research Article**

### **ABSTRACT**

A study was conducted on fish species composition and morphological features of five dominant fish families from the inland waters of Kebbi state, Nigeria between January and December 2017. Three major fishing communities (Argungu, Sabiyel and Yauri) were selected for the study. Fish samples were qualitatively collected from the commercial landings of the fishermen using gill nets. The analysis of the distribution of fish species were analyzed using Microsoft Excel software. In total 18 fish species belonging to 10 families were identified from the inland waters of Kebbi state. Viz: *Bagridae*, *Cichlidae*, *Clariidae*, *Mormyridae*, *Citharacidae*, *Characidae*, *Mochokidae*, *Melaptaruridae*, *Schilbeidae* and *Cyprinidae*. Among the 10 identified families, *Bagridae* (22.22%) and *Mormyridae* (16.66%) which accounted for four and three species respectively, were the most dominant families.

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**Keywords:** Fish species; morphological features; inland waters; Kebbi state Nigeria.

## 1. INTRODUCTION

Fishing is an essential business in many countries of the world, through the provision employment, income and it plays a significant role in assisting livelihood globally and also formulate a significant source of diet aimed at over one billion people [1]. Nwafili Sylvanus and Gao [2] classified the Nigeria inland water fishery resource as the lucrative in fish diversity in the whole West African sub-region with above 311 species. Nigeria has the largest natural aquatic environment that brings spawning and feeding habitats for a huge amount of freshwater and brackish water fish species [3,4]. These aquatic environments with above 270 fish species diversities are outstanding in terms of richness in West Africa [3]. The diversity and conservation of fish in inland water has attracted the attention of many researchers over the periods. There are only a few documented records of fish species composition in spite of the fact that they constitute the bulk of animal protein source. Only a small fraction of inland aquatic ecosystems have been scientifically investigated [5]. Oguniwin [6] discovered about 36 families and 243 species mainly from freshwater, in Niger basin a region of high fish abundance in Nigeria. Similarly, Ita [5] found out that, there are about 268 diverse fish species in 34 well recognized Nigeria freshwater Lakes, rivers and reservoirs, with a surface of about 98,185, kilometer square are equivalent to 12% of the Nigeria entire area. Kebbi State is blessed with abundant inland fisheries resources that contribute to the livelihood of Artisanal fishermen in the state. Despite the considerable importance of small-scale fishing in Kebbi state, scanty published literature on species available in the inland waters. Therefore, the present study attempts to complement the gap.

## 2. MATERIALS AND METHODS

### 2.1 Study Area

Kebbi state is situated in the extreme north-western of Nigeria. It is lies between latitude 13°54'58.93" - 11°7'27.00" N and longitude 3°32'58.00" - 4°53'19.71"E (Fig. 1). It covers approximately 18.591 Km<sup>2</sup> and with a population of about 2.757.544 million people almost [7]. The mean annual temperature is between 35°C to

40°C, annual rain fall range of 450-1050mm and relative humidity ranges from 51-79% and 10-25% during rainy and dry seasons respectively. The main economic activity is agriculture and over 70% of the people practice one form of agriculture or the other [8].

### 2.2 Fish Samples Collection

Fish sample were collected from three different landing centers A, B and C namely Argungu, Sabiyel and Yauri respectively during the months of January to December 2017. These three sampling sites cover the fishing grounds of Kebbi State and were chosen to represent the geographical locations of the fishery and the targeted stocks and to account for geographical differences in species availability and composition. The frame survey involved going round the entire three selected landing sites recording of the content of a canoe that had landed from a fishing trip. The commercial catch was acquired from fishermen working within the inland waters of Kebbi State and the raw data contained monthly catch returns (kg) per species, location and date were recorded [9]. These fishermen used the gill net with the mesh size of the minimum 30m net was 1.25 inches, while the medium 30m net was 1.50 inches and maximum 30m net was 1.75. The gill nets were regularly set in between 5pm and 6pm (evening) and pick up between 7am and 9am (morning). Ikomi and Odum [10] revealed that setting the nets in the mornings and removing them up in the afternoons or evening had continuously resulted in very poor catches.

### 2.3 Species Identification

The fishes trapped and caught at night were removed from the nets in the following morning and preserved in polythene bags. Similarly, 10% formalin solution was added to prevent spoilage since the two site (A and C) were more than 100km each away from the laboratory. In the laboratory, the fish caught was examined, arranged, and sorted according to the family and species and the number of individuals for each species was recorded. The identities of the specimen were determined through keys and description in the existing literatures of [11,12,13]. The samples were later preserved in the laboratory for other analyses.

### 3. RESULTS AND DISCUSSION

#### 3.1 Fish Species Composition

In total of 18 species representing 10 families were identified from the inland waters of Kebbi State, Nigeria (Table 1).

**Table 1. Composition and relative abundance of fish species and families from inland waters of Kebbi state Nigeria**

S/N	Family	Species	Stations			%
			A	B	C	
1.	Bagridae	<i>Bagrus bayad</i>	●	●	●	22.22
		<i>Bagrus orientalis</i>	●	●	●	
		<i>Clarotes lateceps</i>			●	
		<i>Bagrus docmac</i>	●	●	●	
2.	Cichlidae	<i>Oreochromis niloticus</i>	●	●	●	5.56
		<i>Clarias anguilaris</i>			●	
3.	Claridae	<i>Heterobranchus bidorsalis</i>	●	●	●	11.11
		<i>Gnatonemus tamandua</i>			●	
4.	Mormyridae	<i>Hyperopsis bebes occidentalis</i>	●		●	16.66
		<i>Mormyrus rume</i>		●	●	
5.	Citharacidae	<i>Citharinus citharus</i>	●		●	5.56
		<i>Hydrocynus forskalii</i>	●		●	
6.	Characidae	<i>Alastes macrolepidotus</i>			●	11.11
		<i>Synodontis nigrita</i>	●	●	●	
7.	Mochokidae	<i>Hemisynodontis membranaceus</i>	●		●	
8.	Melaptaruridae	<i>Melaptarurus electricus</i>	●	●	●	5.56
9.	Schilbeidae	<i>Schilbe mystrus</i>		●	●	5.56
10	Cyprinidae	<i>Labeo coubie</i>	●		●	5.56
<b>Total</b>			<b>13</b>	<b>9</b>	<b>18</b>	

Note: (●) represent presence of fish species in a station



**1A- Bagrus bayad (Bagridae)**



**1B-Mormyrus rume (Mormyridae)**



**1C-Clarias anguilaris (Clariidae)**



**1D-Hydrocynus forskalii (Characidae)**



1E-Synodontis nigrita (Mochokidae)

**Plate 1(A-E). Picture of the five dominant fish families collected from the inland waters of Kebbi State, Nigeria**

All the 18 fish species present in the inland waters of Kebbi state were found in station C. This was followed by station A where 13 fish species were encountered. The least fish species abundant station was B where only 9 species were recorded as at the time of this report (Table 1). The family *Bagridae* which accounted for 22.2% of all the fish species encountered was the most abundant family. This is similar to what was obtained in a study of fish composition and diversity assessment of Apodu reservoir, Maleta, Nigeria where *Bagridae* was found to be the most dominant [14]. The five fish families that were present and dominant throughout the study area are likely due to the relative abundance of the species in northern Nigeria, as indicated by Ataguba, et al. [15] and Adeosun, et al. [16] who noted that *Mormyridae*, *Cichlidae*, *Characidae*, *Mochokidae*, and *Clariidae* were more common in northern Nigeria and likewise, the type of harvesting method as indicated by Allison and Okadi [17].

In a study conducted by [18] 46 fish species belonging to 28 genera and 16 families in the flood plain of Cross River, Nigeria were discovered with members of the *bagridae* family forming the most plentiful, followed by the *cichlidae* and *clariidae*. Similarly, Oboh and Dan-Kishiya [19] discovered that there were 81 species of fish belonging to 42 genera and 27 families in Osuma river, Abuja. The most abundant in terms of frequency of occurrence were the *mormyridae*, *mochokidae* and the *cichlidae*. This shows that the families *mormyridae*, *mochokidae* and *cichlidae* form the bulk of fish species present and caught in the

inland waters of Nigeria.

### 3.2 Morphological Description

*Bagridae*: This family is one of the most diverse in the study area (Table 1). It is found in fresh water; Africa and Asia to Japan and Borneo. These species are observed to have a wide range of natural distribution in all principal river-systems of Africa. They were reported in the Nile River, Lakes Albert and Turkana, Lake Chad, Niger and Senegal Rivers and also found in Setit in Eritrea and the Tekeze basins in Ethiopia [20].

*Bagridae* are commonly known as naked catfishes or bagrid catfishes (Plate 1A). Their body is moderately elongated and relatively large head with protruding, oval-shaped, bulbous eyes. Their dorsal fin is preceded by a spine, typically with 6 or 7 soft rays (rarely 8-20); adipose fin present and highly variable in size between species. They have jagged pectoral spine; usually 4 pairs of well-developed barbels including a pair from the nostrils. Their snout is pointed, slightly longer than, or equal to the width of the mouth while fins are pointed and the color is silvery [20].

*Mormyridae*: The anal, caudal and pelvic fins are present, caudal penduncle is narrow, caudal fin extremely forked while the teeth are present on parasphenoid and tongue. It has 6-8 branchiostegal rays; dorsal fin rays 12-91 and anal fin rays 20-70. The dorsal and anal fins are frequently opposite and positioned back on body, the mouth is very variable with a lengthened proboscis-like snout with terminal mouth and there is extend

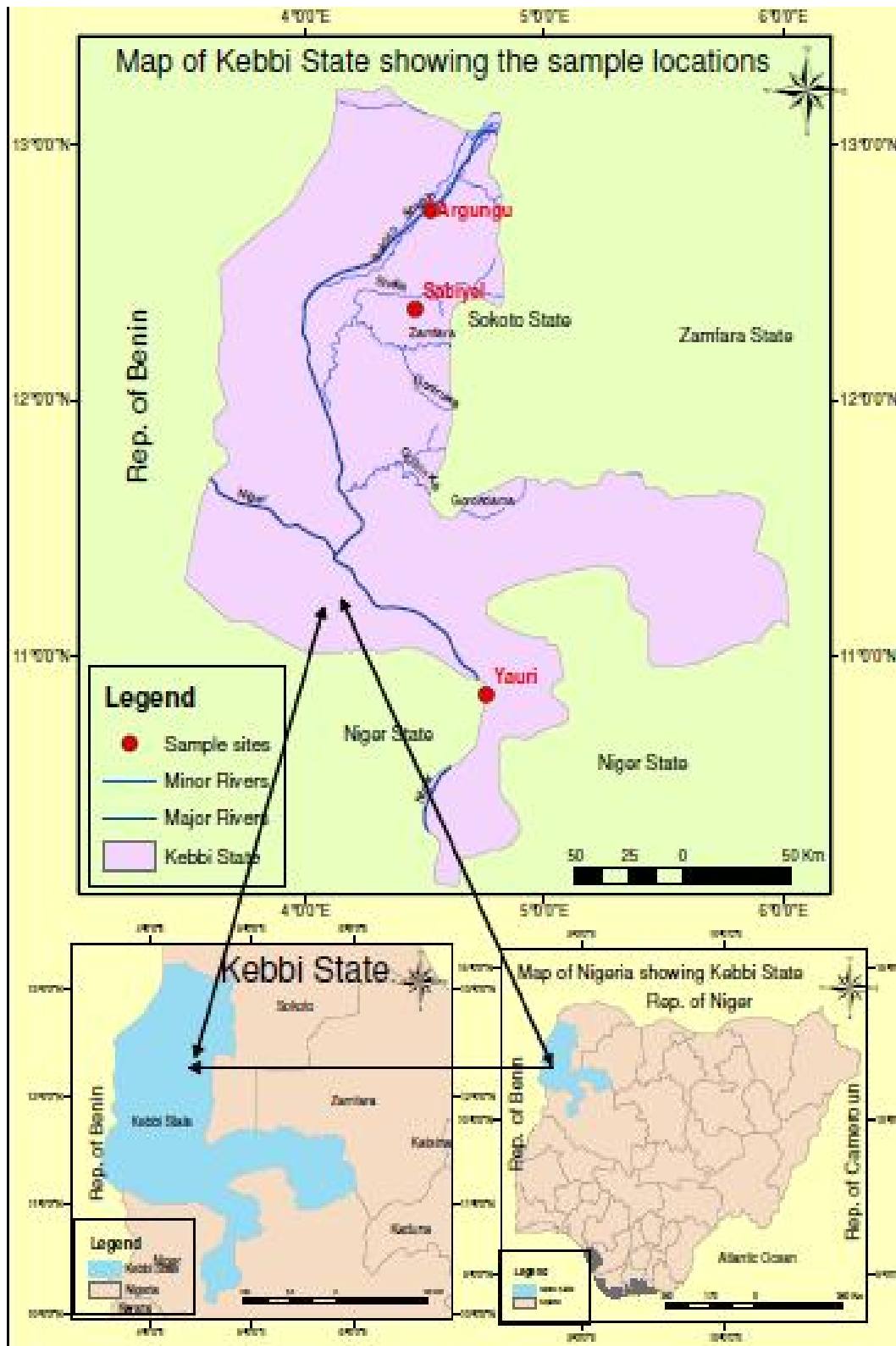


Fig. 1. Map of study area and sampling stations (• dots)

lower jaw, whereas in others there is a rounded snout with an undershot mouth. Length can be up to 1.5m [21]. Example, *Mormyrus rume* (Plate 1B) can be found in freshwater of tropical Africa and Nile [22,23].

**Clariidae:** They occur both in south-east Asia and in Africa with the highest generic diversity found on the African continent where some 14 genera and 74 species have been reported [20] against two in south-east Asia. In both continents, *Clariidae* are of great economic importance as food fish. For several years, species of the genus *Clarias* have been used in local fish culture where they proved to be a fast growing protein source. In south-east Asia, especially *Clarias batrachus* and to a lesser extent *C. macrocephalus* have been used, while in Africa *C. gariepiinus* [24]. Dorsal fin base very long situated close to occipital process, usually with additional 30 rays, not preceded by a spine, separate or continuous with caudal fin and distance between both is small. Pectoral and pelvic fins are constantly absent in some species, caudal fin is rounded, gill opening wide with typically 4 pairs of barbels and air-breathing labyrinthic organ arising from gills arches. Anal fin originates closer to caudal fin than to tip of the snout, the pectoral fin extends from operculum to base of first dorsal fin rays. The vomerine teeth are mostly pointed, forming a band not broader than that of the pre maxillary. The dorsal fin has 66-77 and the anal fin 52-61. (Plate 1C *Clarias anguillaris*) Several members of this family can travel short distances over land. It can be found in freshwater of Africa, Syria and southern and western Asia.

**Characidae:** The body is long and slender with a deeply forked tail. The adipose dorsal fin is very small. Dorsal fins are uniformly greyish, caudal without black edge, and adipose fin is grey. (Some characins lack the adipose fin). The nostrils are close together near the eye and the eye has a well-developed adipose eyelid. The body is grey on the back, sides are silvery and there are dark longitudinal stripes along each row of scales above the lateral line. The dorsal fin is grey, the upper lobe of the caudal is grey lower one bright red. Maximum lengths about 1.4m, at the extreme, many members of the family are under 3 cm and the smallest reach a maximum size of about 13cm. This is the only entirely freshwater fish family native to both Africa and South America [25-27]. *Hydrocynus forskalii* is an example and can be seen in (Plate 1D).

**Mochokidae:** Adipose fin typically very large, anal fin with fewer than 10 rays, dorsal and pectoral fin spine usually short, slightly curved, strong and with a locking mechanism. It has 3 pairs of barbels, nasal barbel is absent and mandibular barbels may have many branches, some with lips and part of barbels modified into an oral sucker. The upper edge of the small adipose dorsal fin is more or less horizontal and forms a straight line with that of the back. The forked caudal fin usually has lobes of equal length. The pectoral spines are lightly serrated on the exterior edge and deeply toothed on the interior edge. Adipose fin  $\frac{1}{4}$  of the standard length and external mandibular barbel with few short ramifications, inner mandibular barbel with short, thicken and tubular ramification. The body is brownish-grey in color with many small round black spots on the body and fins [28] *Synodontis nigrita* (Plate 1E).

#### 4. CONCLUSION

The objectives of the study were to detect the fish species composition and morphological descriptions of five dominant fish families from inland waters of Kebbi state-Nigeria. A total of 18 species belonging to 10 families were accounted and acknowledged from inland waters of Kebbi state, amongst them *Bagridae* were the most dominant family with 4 (four) species present in the inland waters of Kebbi state followed by *Mormyridae* 3 (three) species, *Clariidae*, *Characidae* and *Mochokidae* has 2 (two) species each. Other contributing families are *Cichlidae*, *Citharacidae*, *Melaptaruridae*, *Schilbeidae* and *Cyprinidae* of which each family belong to one species. The species recorded were not evenly distributed in the study area. This may be attributed to pollution, overfishing, and illegal fishing activities or the type of fishing gear used. Although only traditional fishing is being practiced in the study area, small-scale fishing is also being carried out. This was evident with the diverse types of fishing gears that were spotted during the study.

There is the need for diversifying aquaculture and other alternative sources of income to reduce pressure on wild fish. The fishing methods and gears used should be standardized while monitoring of fishing activities should be enforced. In addition, regular resource survey and training of artisanal fishermen in the study area should also be intensified.

## ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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