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Indigenous fish identification methods in lakes Kainji and Jebba, Nigeria

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ABSTRACT: A survey was carried out to investigate the local fishermen's perception of fish identification. The study revealed that the fishermen are clearly aware of the differences in fish species. The fishermen classify fish by assessing the morphological features as well as observing the behaviour of fish. Integrating such local knowledge into conventional fish taxonomy will lead to better practical definition of such classification and further yield results that are beneficial to the fishermen.

Key Words: Indigenous, Identification, Kainji, Jebba, Nigeria

Introduction

A weakness of many fisheries projects is that they frequently do not take much account of the opinion of the fisherfolks. There is now a growing recognition that the knowledge and management skills of fisherfolks can be invaluable inputs to any plans to develop rural areas. These skills have evolved over generations and incorporate the fisherfolk's understanding of the local environment and of their own management experience. Kundiri *et al.* (1989) asserted that the failure of planners to integrate this local knowledge and skills into policies decisions has contributed to the poor results of many well intentioned rural development projects.

The array of knowledge which could be harnessed from the local fishermen is vast, and this could incorporate all aspects of fisheries beginning from the idea and skill of catching fish up to its consumption. As one of the very important fields in fish biology, fish identification plays a major role in giving guide on the resource we manage. The knowledge of fish artisans in this area would add value to the conventional management such as: 1.easy detection of offsprings and new species of fish. Beach *et al.* (2008) reported that hybridization is observed in nature on many instances. Fish hybridization is observed more frequently in the wild than any other group of vertebrates in which several factors including – external fertilization, weak ethological isolation mechanisms, unequal abundance of two parent three species, competition for spawning habit, susceptibility to secondary contact between recently evolved forms and introduction of non-native fish specie into a freshwater habitat – contribute to the increase in the rate of the incidence.

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2. Effective implementation of regulations pertaining to species of fish caught in different water bodies. A report by Idaho Fish and Game (2008) highlighted that it is important to be able to identify the fish one is trying to catch. This is because where there are regulations, such regulations differ for each species therefore it is imperative to know the species so as to know which regulations apply. 3. Artisanal fisheries development. In India and china, aquaculture is practiced by local fish farmers. Their contribution to fish farming has gone a long way to place these nations among the top leading nations in fish farming. Sometimes they get their seeds from the wild, it is therefore important to be familiar with cultivable species.

The questions raised in this study are: how does the socio economic characteristics of the fishermen affect the way they identify fish? What is the fishermen appreciation of fish identification? On what basis do they identify fish? and how does their perception relate to the concept of a trained biologist (taxonomist).

Materials and Methods

Study areas

Lake Kainji, which is the largest man - made lake in Nigeria, was created in 1968 after the damming of River Niger for electricity generation by the National Electric Power Authority (NEPA). The Lake lies between Latitudes 9^0 50'and 10^0 55'N, and Longitudes 4^0 25' - 4^0 45' E and between the borders of Sub - Saharan and Northern Guinea Savanna zones. It has a maximum length of 134km, maximum width of 24.1km, mean and maximum depth of 11m and 60m respectively, surface area of 1270 km^2, a volume of 13×10^9 m^3, and catchment's area of 1.6 x 106 km^2. (Obot, 1989)

Jebba basin also designed to generate electricity is situated between latitude $9^0$06' and $9^0$55' north and longitude $4^0$02' and $4^0$45' east. The dam is about 3 kilometers upstream of Jebba town with tributaries which include Awun, Eku, Moshi and Oli rivers. It falls within the savanna zone but specifically Guinea savanna. Jebba Lake bounded on the eastern side by Niger state and on the west by Kwara state, and with a surface area of 303sq km is smaller than Kainji Lake. The total storage for Jebba Dam is 1×10^9 m^3. The predicted fish catch potential using primary productivity and morphoedaphic factors of Jebba lake was estimated at 909 – 1818 tons/annum (fresh weight). Kainji Lake Research Institute (1983).

Six fishing villages were selected as the study areas among which are Cover dam, Munai and Wara in kainji and Gbajibo, Fakun and Awuru in Jebba lake basins of Niger state. The survey was carried out in two phases. The first phase was in Jebba lake basin where 32 fishermen were interviewed while the second phase was in Kainji lake basin and 48 fishermen were also interviewed, giving a total of 80 fishermen aged between 22 and 58 years.

The choice of Kainji and Jebba lake basins was so as to get the perception of the fishermen of the two basins pertaining to their identification methods. This is because most of the species of fish are common to the two lake basins. Figures 1 and 2 shows study areas on Kainji and Jebba lakes respectively.

Interviews were carried out in Hausa which is the most widely spoken local language in the study area. The interviews were loosely structured but based around a questionnaire to focus on specific issues. The fish species used for the study were purchased from the fishermen, tagged and digital photographs taken for a confirmatory identification. Some specimen which include *Clarias gariepinus, Heterobranchus longifilis, Oreochromis niloticus* and *Tillapia zilli* were preserved in 4% formaldehyde solution. This was used to ascertain the fishermen's level of understanding of the differences in the morphological features of fish species, as it was assumed that *Clarias gariepinus* and *Heterobranchus longifilis* may be regarded as same to a lay man at first sight, so also *Oreochromis niloticus* and *Tillapia zilli*. Frequencies and percentages were used as statistical tools for analyzing the data.

North

10.30 N

Scale (Kilometers)

Niger State

Foge

Kebbi State

Warra

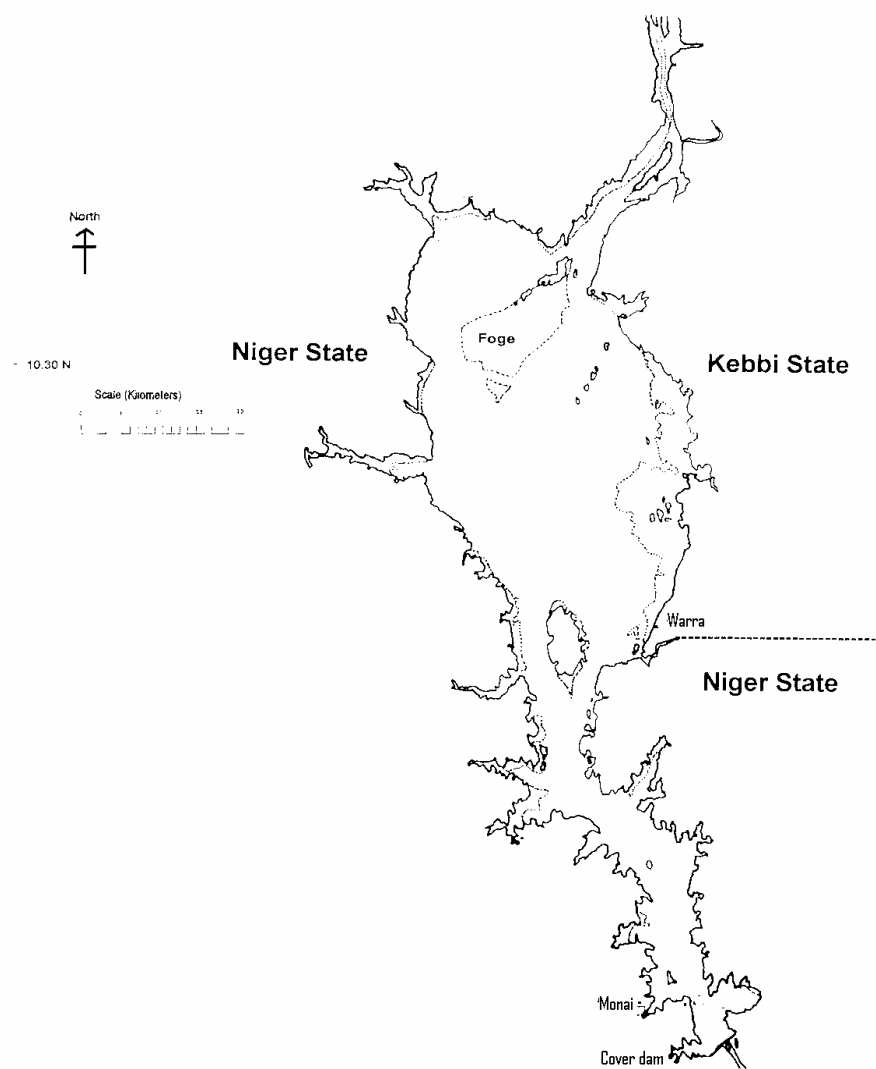**Niger State**

Monai

Cover dam
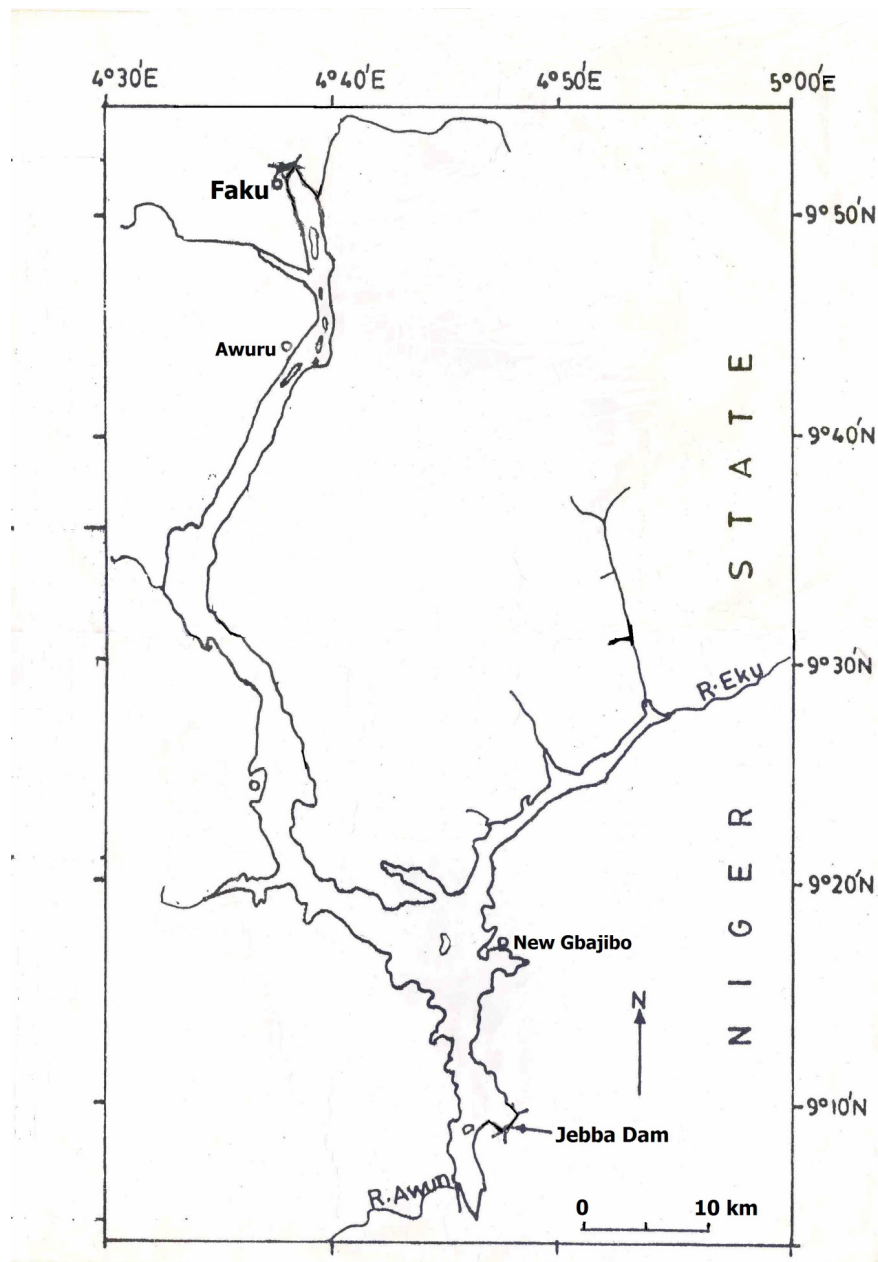
Figure 1: Study areas on Kainji Lake

Figure 2: Study areas on Jebba Lake.

Results and Discussion

Socio-economic Characteristics

Table 1 shows some of the socio economic characteristics of the fishermen. The ages of all the fishermen interviewed falls within 22-58. 56 % constituted those within the ages 32-41. This category may be considered to be the most active. Those that their ages fall between 52 and above constituted just 11%, and they are the most experienced due to number of years spent in the venture. 85.8% of the respondents are married while 14.2% are still single. There were no women among the entire respondents; men constituted 100% of the population. This is because fishing is looked at as an occupation mainly for men in this part of the country. It is noteworthy however

that 2% of the respondents affirmed that they were taught to identify fish by their mothers. Majority (83%) of the respondents have Qur'anic education while only 13% and 4% have attended primary and secondary education respectively. None have attained to tertiary education. 14-23 was the least among the categories of the years attained in the occupation and 18% of the respondents fall within that range. The highest range 44-53 formed 19.6 %. The highest percentage 40.0 was within the range 34-43 while the remaining 22% falls within 24-33. It was observed that better understanding and experience had direct link with the number of years attained in the occupation. Despite that, it was clear that wealth of experience have been gained among all the categories of age because even those within the least category who are the youngest showed tremendous understanding of the resource they handle.

Table 1: Socio- economic characteristics of fishermen in the study areas.

Variables	Frequency	Percentage
Age		
22-31	14	18
32-41	45	56
4251	12	15
52 and above	9	11
Marital status		
Married	69	86
Single	11	14
Gender		
Men	80	100
Women	0	0
Educational level		
Tertiary	0	0
Secondary	3	4
Primary	10	13
Qur'anic	66	83
Number of years in occupation		
14-23	14	18
24-33	18	22
34-43	32	40
44-53	16	20

Fishers' appreciation of Fish Identification

The study revealed that fishermen have names for species of fish. Most species have their names but they sometimes generalize name for all species in a family. Table 2 shows the fishermen's appreciation for fish identification. Respondents were asked how they learned to identify fish; majority (81%) out rightly said they inherited it. In more practical term, they regarded it as an act of nature because they found themselves doing it and no body taught them. When asked if they encounter problems identifying fish, all (100%) of them affirmed that all the fish in the water on which they operate are familiar to them, as such they don't have problem identifying them. They proved their claim by describing the fish seen with them or shown to them. To probe them further, they were asked to differentiate between *Clarias gariepinus* and *Heterobranchus longifilis*; and *Oreochromis niloticus* and *Tillapia zilli*. All (100%) used the adipose fin to differentiate *Heterebranchus longifilis* from *Clarias gariepinus* while, vertical lines on caudal fin of *Oreochromis niloticus* was used to differentiate it with *Tillapia zilli*. 65% linked the need to identify fish to occupational hazard as some revealed wounds and marks of wounds left on them by certain species of fish which they regard as "mugayen kifi" (literally meaning wicked fish). 58% relate fish identification with technique/strategy for fishing as they claim that some fish are difficult to catch, therefore, certain strategies have to be applied. Only 6% related it to conservation although they base their claim on government's fisheries laws on some species. 40% indicated that they supply fish farmers with catfish once a year or a maximum of 3 times in a year.

Table 2: Fishermen's appreciation of fish identification.

Variable	Frequency	Percentage
How did you learn to identify fish?		
I inherited	65	81
Taught by father	9	11
Taught by mother	2	3
friends	5	6
Do you encounter problems identifying fish?		
Yes	0	0
No	80	100
Why do you need to identify fish?		
to prevent attack by dangerous species	52	65
to know techniques/strategies for fishing	46	58
for conservation	5	6
Do you supply fish to fish farmers?		
Yes	32	40
No	48	60
How often do you supply the fingerlings?		
once a year	5	16
Twice a year	18	56
Thrice a year	9	28

Basis for Identification

They base their identification on morphological features rather than the use of certain internal organs of fish which might probably be a bit advanced for them. However, there are other means which they learned over many years of experience. This include behavior and location of fish in water and outside, for instance, "Takasa" a specie in the family Cichlidae which they say has peculiar feeding habit. It can come out of water and allow insects cover its entire body, then return back into the water and feed on the insects.

It is also the only fish as far as they are concerned that can leap and enter a person's mouth and sometimes even right down the throat before spreading out its fins/rays. This behaviour according to them has been fatal. "Bafilacen balo" can shoot its spine into human flesh and such spine can take a long while before it can be seen or it rotes. "Yakudi" another specie in the family Cichlidae stays in burrowed soil under water. "Fura" a specie in the family Mormyridae when held by the caudal peduncle, shocks like electricity. These behaviours validate the assertion by Howe (1998) that although it is common practice to use morphological characteristics to classify fishes, in some instances behavioural attributes among others may also be utilized. They also distinguish fish by their strength. In the family Distichodontidae, a specie they refer to as "Gambu" is the weakest among all the species.

Table 4 shows the morphological features used by the fishermen in identification of fish. It is evident that most of the features used by the fishermen are same as the ones used conventionally. Like in the conventional method, colour is very important to the fishermen and therefore they use it most frequently as one of the features in identifying all the fish species. Because they have mastered over a long period of time, even the slightest differences in colour can be detected by them. Size is also important to them as they could actually differentiate species of fish that belong to the same genus based on size. Other features used include: mouth, barbells, scales/skin, fin/spine, teeth, lateral line, body shape, head shape and size, body size, sexual difference. Although none of the respondents used nostrils and sex difference in identification, they all affirmed that it is easy to differentiate sex in fish as the females are always smaller but bulgy around the stomach than the males.

Table 3: Number of species known conventionally and by local fishermen.

Family / Species	Hausa name	Number of species known conventionally	Number of species known to local fishermen	Other species known to local fishermen
Mormyridae *Mormyrus rume*	Miligi	+3	3	
Gymnarchidae *Gymnarchus niloticus*	Yauni	1	1	
Distichodontidae *Distichodus rostratus*	Cihaki	+2	3	Gambu, Kilimini, Shawarwari.
Mochokidae *Synodontis membranacea*	Kurungu	+20	10	Farin kurungu, Jan kurungu, Dan maisa, Matadi, Baro, Tuko, Kurkura, Damisan karaya, Mai kaya tara.
Bagridae *Bagrus bajad*	Doza	+2	3	Jan doza, Farin doza, Balagi.
Centropomidae *Lates niloticus*	Giwan ruwa	1	1	
Cyprinidae *Labeo senegalensis*	Dumi	+2	3	Dubi, Farin dumi, Dorawa.
Cichlidae *Sarotherodon galilaeus*	Gargaza	+9	9	Takasa, Kulakula, Diska, Holinga, Yakudi, Mai kara, Mai bakin giwa, Kwada ganga, Buku, Kasheni gidana.
Claroteidae *Chrysichthys auratus*	Worushe	+2	2	Obakun, Farin worushe
Claroteidae *Auchenoglanis occidentalis*	Buro	+1	2	
Claroteidae *Clarotes laticeps*	Maigo		2	Maibatu
Clariidae *Clarias gariepinus*	Kulumi/Tarwada	+9	6	Tarwada
Mormyridae *Marcusenius senegalensis*	Gandaga	+	3	Fura, Goron minigi
Citharinidae *Citharinus citharus*	Falia	+1	2	
Alestidae *Hydrocynus forskali*	Zawai	+2	2	Mara hakori
Alestidae *Alestes baremoze*	Shimani	+2	2	
Tetraodontidae *Tetraodon lineatus*	Tallibonbon	+1	2	Bakin tallibonbon
Malapteruridae *Malapterurus electricus*	Magariya	+1	1	

Table 4: Morphological features and frequencies of usage by the fishermen in fish identification.

Scientific name	Hausa name	colour	Mouth	barbels	Scale/skin	Fin/spine	nostril	Teeth	Lateral line	Body shape	Shape of head	Size of fish
Mormyridae *Mormyrus rume*	Miligi	+++	+++		++					+++	+++	+++
Gymnarchidae *Gymnarchus niloticus*	Yauni	+++	+++			+		+++		+		+++
Distichodontidae *Distichodus rostratus*	Cihaki	+++	++		++	+			+	+	++	+++
Mochokidae *Synodontis membranacea*	Kurungu	+++	+	++		+++				++	+++	+++
Bagridae *Bagrus bajad*	Doza	+++	++	+++		+++				++		+++
Centropomidae *Lates niloticus*	Giwan ruwa	+++	+	+		++			+++			+++
Cyprinidae *Labeo senegalensis*	Dumi	+++	+++			++					+++	+++
Cichlidae *Sarotherodon galilaeus*	Gargaza	+++	+		+	++				+	+	+++
Clarotidae *Chrysichthys auratus*	Worushe	+++	+++								+++	+++
Claroteidae *Auchenoglanis occidentalis*	Buro	+++	++			++					+++	+++

Key: + = frequently   ++ = very frequently   +++ = most frequently

Fishers' perception of Fish Identification

The study showed that the fishermen have subjective methods of identifying and describing the different species of fish and they have names to differentiate each specie of fish. Their description of individual specie is based on sight and touch, taking into account colour, mouth, barbells, scales/skin, fin/spine, teeth, lateral line, body shape, head shape, size. Table 4 shows the frequency of usage of the morphological features for individual species.

Colour

Fish generally have a wide variation in colour patterns. In the fishermen's perception, it is the first important criterion used in distinguishing between fish. It is possible that because of their many years in the practice and due to close observation of the animals they have been able to distinguish species that have similar colour. As it is in the conventional method, the local fishermen have been able to differentiate species using distinguishing colours. This is evident by the names some species of fish are called. For example in the family Mochokidae, they refer to the species as "farin kurungu", "Jan kurungu" and "Mai kalan damisa" literarily meaning white synodontis, red synodontis and leopard coloured synodontis; respectively. They do this bearing in mind other features to differentiate those that are closely alike by colour. This was evident when they further categorized "Mai kalan damisa" into different species.

Mouth

The fishermen are well aware of differences in mouth types. They describe species as either "Mai guntun baki", or "Mai dogon baki" meaning short mouth or long mouth respectively. They actually take cognizance of species

possessing short/long upper or lower jaw where as some have equal upper and lower jaw. This represents the conventionally known terminal, superior, inferior and snouted mouth types.

Barbels

"Gashin baki" is what they use to describe barbells in fish. They recognize fish as possessing short, long or bushy barbells depending on specie of fish.

Scale / Skin

Although the fishermen did not recognize the types of scales known conventionally, they however attested that some scales are big and others small, they also described some fish based on none possession of scales. Family like the Tetraodontidae was described based on the spiky nature of their skin.

Fin / Spine

These were frequently used to identify some of the fish. They recognized differences in shapes of fin, presence or absence of spines, their number and location on fish. They described two species in the family Bagridae as having a filament-like structure at the tip of their caudal fin. One specie of the family Mochokidae which they refer to as "Mai kaya tara" (meaning possessing nine thorns) has nine spines that are strategically located.

Teeth

They conveniently identified species which possess teeth. Among them are "Yauni" – *Gymnarchus niloticus*, "Zawai" – *Hydrocynos forskali*, "Shimani" – *Alestes baremoze* and "Tallibonbon" – *Tetraodon lineatus.* Although they are also aware that some of the specie like *Gymnarchus niloticus* attacks any intruder on the bases of parental care, they refer to them as dangerous.

Lateral line

They described "Cihaki" – *Distichordus rostratus* as possessing visible lateral line. Although the degree of visibility in the family Distichodontidae depend on the specie.

Body shape

This is important in describing some of the species by the fishermen. In describing "Falia" – *Citharinus citharus*, they refer to it as having a wide and robust type of body. This may mean a doso-ventral compressed type of body that some fish possess and not the usual fusiform shape.

Shape / Size of head

"Katon kai" - big head, "Karamin kai"- small head, "Dogon kai"- long head and "guntun kai"- short head were what they used to describe the shape of head of different species.

Size of fish

This is another very important feature for identification to the fishermen. Especially among species under the same family, they take cognizance of some species as being smaller than others. They attested that though size is important to them in identification, they do not confuse it when determining the sex of fish as according to them males are usually bigger than females.

Conclusion and Recommendations

It is clear that many fishermen have a good understanding and have a large body of skill and knowledge about local method for identification of fish. This knowledge is invaluable for validating and amending assessments based on scientific principles. Furthermore, building this local knowledge into development programmes will help to

ensure better acceptance. It is therefore recommended that careful evaluation of the fishermen's knowledge should be embarked upon; this will cause the development of the rural areas.

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