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Cultivable fish species of river awe, Nasarawa state, Nigeria

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Abstract
The River Awe was investigated for its diverse fish fauna with the aid of conventional fishing gears. 10 Orders, 21 Families, 24 Genera and 37 Species were found. Conventional and unconventional cultivable species found were: *Tilapia sp*., *Heterobranchus spp*., *Clarias gariepinus*, *Labeo coubie*, *Parchanna obscura, Bagrus sp*., *Heterotis niloticus*, *Lates niloticus Gymnarchus niloticus* and *Citharinus Citharus*. The study concludes that indigenous fish species discovered can be better exploited for their cultivable potentials if they are prioritized in response to the country's aquaculture potentials to enhance fish food protein sufficiency and empower the citizenry.

Keywords: River Awe, Fish species, Cultivable, Aquaculture.

1. Introduction
Nigeria has placed little emphasis on one key priority area since the oil boom, the under exploitation of the abundant cultivable fish species in its natural environment. Nigeria for long has depended heavily on imported fish and the buildings of indoor hatcheries which are capital intensive and require highly skilled labor to manage and sustain.
Inadequate data base on which to formulate developmental and sustainable projects on the biological and ecological requirements of indigenous or aboriginal fish species which possesses high aquaculture production potentials is among the major constraints of aquaculture development in Nigeria. A survey of culturable fish seeds across Nigeria carried out in the 80's showed that there are potentially viable culturable fish species indigenous to every region that are of aquaculture potential. But, the governments of those regions have failed to take comparative advantage towards this resource.
In 2000 the Ministry of Agriculture disclosed that Nigeria spends 3 Billion USD annually on fish importation. In 2007, the demand for fish was put at 2.66 million metric tons, the local industry supplied just above 600,000 metric tons with importation put at about 740,000 metric tons. Only about 1.24 million metric tons was supplied in total as against the demand of 2.66 million metric tons, revealing a deficit of about 1.4 million metric tons (Market, 2013) [1]. In 2012 the Ministry of Agriculture again disclosed that Nigeria aquaculture potential was 4 million metric tons. Fish provide the cheapest source of digestible animal protein in Nigeria. However, the gap between the demand and supply of fish cannot be met through captured fisheries (FAO, 1994) [2]. Today, there are fewer fish to catch from rivers and streams due to increasing human population and human activities, changes in the natural habitat (ecosystem) of fish that is fast deteriorating via deforestation, building of dams for hydropower generation and irrigation, building of road and bridges and the ever increasing urbanization (Rajbanshi, 1996) [3].Therefore, the cultivable potential of available fish species has to be harnessed globally by specialist teams in the industry from their endowed inland water resource.
Fish farming industry contributes about 35% of the total animal protein consumed in Nigeria (Market, 2013) [1]. Fish seeds are expensive and constitute a major operational cost of about 20% (Abiodun, 1986) [4]. Nigeria is endowed with extensive internal water system, lakes, reservoirs, estuaries, lagoons, creeks, floodplains and approximately 800km of marine coastline. This reveals a tremendous aquaculture potential. Fish species such as *Carp, Tilapia, Heterobranchus* and *Clarias sp*. are the most commonly found in Nigerian waters and Fish markets. Nasarawa State in central Nigeria is advantageous in this area endowed with an estimated water surface area of 5,635. 33ha, comprising of rivers and lakes/swamps (5,037.5ha), dams and reservoirs (484.0ha), mining paddocks (47.0ha), and fish ponds (above 77.73ha) (Ogbe, 2009) [5]. The River Awe is loved by fishermen who patronize especially

during the peak seasons for it abundant fish species of commercial value.

The objective of this study is to investigate and present a fairly detailed information on the number of cultivable fish species and their cultivable potentials available in the River Awe in Nasarawa State, Nigeria.

2. Materials and Methods

2.1 Study Area

Awe is located south of Nasarawa State ($8^0$6'N and $9^0$7'E), Its UTM position is NP19 and joint operation graphics is NC32-15 and 166m above sea level. The River Awe is located adjacent 'Tsohon Gari' and lies between latitude $8^0$10'N of the equator and longitude $9^0$14'E (Fig.1).

The River is linked to other rivers which finally drain into the River Benue. The river is surrounded by shallow mountains with narrow valley, rocks, trees and grasses; shaded more in some areas than others. The river is engaged by neighboring settlers with activities of fishing, washing, processing of agricultural products, etc. four sampling sites were selected for the study (Fig.1).

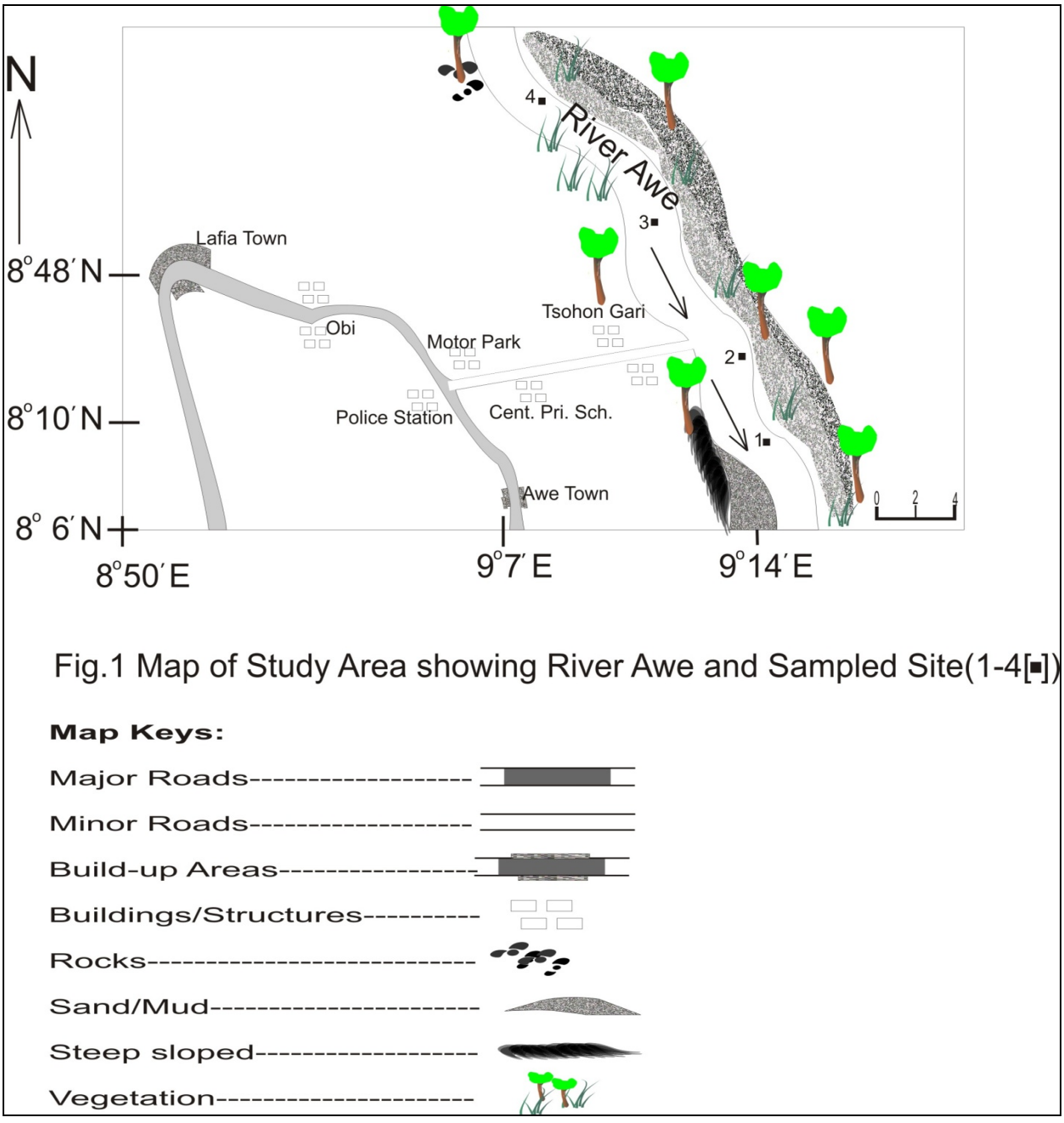

Fig.1 Map of Study Area showing River Awe and Sampled Site(1-4[■])

2.2 Fish Fauna

Fishing was done by artisanal fishermen using various fishing gears such as cast nets popularly known among local folks as 'Birgi', Purse seines, Gill nets and Malian traps. A constant fishing effort was maintained using the same inputs: Men, gears and hours at each sampling trip which was done randomly. Fishes caught were carefully examined and identified using NIFFR (National Institute for Freshwater Fisheries Research) guide to orders and families in fish identification.

3. Results and Discussion

Table 1: The Fish Species of River Awe

SN	Scientific Name	Common Name	Local Name
1	*Protopterus annectens* (Owen, 1883)	African lungfish	Mainono, Zuala
2	*Polypterus ansorgii* (Boulenger, 1910)	Guinea bichir	Gwando
3	*Heterotis niloticus* (Cuvier, 1829)	African arowana	Bali
4	*Mormyrus rume* (Valenciennnes, 1846)	Trunkfish	Milligi, Bulun
5	*Mormyrus macrophthalmus* (Günther, 1866)	Trunkfish	Milligi, Bulun
6	*Mormyrus hasselquisti* (Valenciennes, 1846)	Trunkfish	Milligi, Sawanya
7	*Mormyrops anguilloides* (Linnaeus, 1758)	Trunkfish	Milligi
8	*Gymnarchus niloticus* (Cuvier, 1829)	Frank fish	Dan- Sarki, Yawni
9	*Hepsetus odoe* (Bloch, 1794)	African pike	Zagundumi, Sagei
10	*Hydrocynus brevis* (Günther, 1864)	Characin	Zawai, Jagajaga
11	*Citharinus latus* (Muller & Troschel, 1845)	Moonfish	Falia
12	*Citharinus citharus* (Geoffrey Saint-Hilaire, 1809)	Moonfish	Falia
13	*Labeo coubie* (Rüppell, 1832)	African Carp	Dumi
14	*Bagrus docmak* (Forsskål, 1775)	Silver Catfish	Ragon ruwa
15	*Bagrus filamentosus* (Pellegrin, 1924)	Silver Catfish	Ragon ruwa
16	*Bagrus bajad* (Rüppell, 1829)	Silver Catfish	Ragon ruwa
17	*Auchenoglanis biscutatus* (Geoffrey Saint-Hilaire, 1808)	Catfish	Buro
18	*Auchenoglanis occidentalis* (Valenciennes, 1840)	Catfish	Buro
19	*Parailia pellucida* (Boulenger, 1901)	Catfish	Maigashi, Ariya
20	*Clarias gariepinus* (Burchell, 1822)	African Catfish	Tarwada
21	*Heterobranchus longifilis* (Valenciennes, 1840)	African Catfish	Tarwada
22	*Heterobranchus bidorsalis* (Geoffrey Saint-Hilaire,1809)	African Catfish	Tarwada
23	*Malapterurus electricus* (Gmelin, 1789)	Electrical Catfish	Mijiriya
24	*Synodontis budgetti* (Boulenger, 1911)	Catfish	Kurungu
25	*Synodontis clarias* (Linne, 1758)	Catfish	Kurungu
26	*Synodontis eupterus* (Boulenger, 1901)	Catfish	Kurungu
27	*Synodontis schall* (Bloch & Schneider, 1801)	Catfish	Kurungu
28	*Synodontis courteti* (Pellegrin, 1906)	Catfish	Kurungu
29	*Lates niloticus* (Linne, 1762)	Nile perch	Giwan ruwa
30	*Parachanna obscura* (Günther, 1861)	Snakehead	Tufi, Dunu
31	*Hemichromis bimaculatus* (Gill, 1862)	Jewelfish	Kulkula
32	*Tilapia zilli* (Gervais, 1848)	Red- belly Tilapia	*Gargaza*
33	*Tilapia nilotica* (Linne, 1758)	Nile Tilapia	Gargaza
34	*Kribia kribensis* (Boulenger, 1907)	Killifish	Brabra
35	*Kribia nana* (Boulenger, 1901)	Killifish	Brabra
36	*Dagetichthys lakdoensis* (Staunch & Blanc, 1964)	Killifish	Chichiyawa
37	*Tetraodon lineatus* (Linne, 1758)	Puffer fish	Talibombom

Table 2: Conventional and Unconventional Cultivable Fish Species of River Awe

SN	Conventional Cultivable Species	Unconventional Cultivable Species
1.	*T. zilli*	*H. niloticus*
2.	*T. nilotica*	*L. niloticus*
3.	*C. gariepinus*	*G.niloticus*
4.	*H. longifilis*	*C. citharus*
5.	*H. bidorsalis*	*P. obscura*
6.		*L. coubie*
7.		*B. sp.*

Table 3: Unconventional Cultivable Fish Species of River Awe and their Traits

SN	Species	Outstanding Traits
1.	*H. niloticus*	Rapid growth, breeds in captivity, availability of wild fingerlings and brood stocks, grows up to100cm (SL), 10.2kg (TW), 4,000 – 6,000 Eggs (FR), good for Polyculture and Cage culture system as well sport fishing.
2.	*L. niloticus*	Rapid growth, high premium, breeds in captivity, grows up to 200cm (Max. L), 200kg (TW), 3,000,000–15,000,000 Eggs (FR), good for Polyculture and Cage culture system.
3.	*G. niloticus*	Rapid growth, high premium, tasteful, seasonal availability of wild growers, grows up to 193cm (SL), 200kg (TW), 6,000–9,000 Eggs (FR), good for Polyculture.
4.	*C. citharus*	Rapid growth, tasteful, seasonal availability of wild growers, grows up to 58.0cm (Max. L), 7.0kg (TW), 14,320-16,009 Eggs (FR), good for Polyculture.
5.	*P. obscura*	Rapid growth, tasteful, medicinal properties, seasonal availability of wild growers, grows up to 54.0cm (Max. L), 1.0kg (TW) in 4-5 Months, 126-1,580 Oocytes (FR), good for Polyculture and Cage culture system.
6.	*L. coubie*	Tasteful, seasonal availability of wild growers, grows up to 22.2cm (SL), 619g (TW) 10,411-24,143 Eggs (FR), good for Polyculture and Cage culture system.
7.	*B. sp.*	Fleshy, Tasteful, seasonal availability of wild growers, grows up to 122cm (TL), 12.5kg (TW).

Source: (Hopson, 1972, Olele & Obi, 2004, and Wikipedia, 2014) [6, 7, 8]

The result of the study revealed 10 Orders, 21 Families, 24 Genera and 37 Species as presented in Table 1. The study also revealed over thirty (30) important fishes of commercial value. However, discussions will be limited to conventional and unconventional fishes in the study as presented in Table 2.

According to the FAO (1994) [2], the conventional culturable fish species in Nigeria are: *T. sp., H. sp., C. sp.* and *Carp sp.* Proven to be of higher consumer preference due to their high premium and food productivity as they have been cultured widely in the tropics for food and ornamental purposes. The unconventional cultured ones with low preference probably due to lack of promotion or identification are: *H. niloticus, G. niloticus, L. niloticus, C. citharus,* etc.

In fish culture practice the natural environment of the fish is simulated as much as possible to ensure their survival and growth, and the species that survives under simulated controlled conditions are few because they posses certain qualities that make them good candidates for culture. These qualities include: ability to reproduce in captivity, ability to withstand various handling processes, nature of eggs and young, growth rate, efficient food conversion, economical to culturists, gregarious habit, adaptability and their food habits.

The Aquaculture industry is new with great potentials driven by innovations; and is developing fast at an annual increase of 5 -10% and productions are estimated to be doubled within 2020 – 2030. The fish farming (Aquaculture) industry in Nigeria today is plagued with several problems one of which is the insufficient production of fingerlings or fish seeds of cultivable fish species and it is militating against the industry as the industry's full potentials cannot be harnessed. These species could be promoted to provide cultivable fish alternatives not only to increase production but to also efficiently harness the abundant water resources and increase employment. If these species can reproduce in captivity, then it is possible that a fish culturist remains in business all year round. He can collect his brood fish from the wild and have them reproduce either in ponds, cages or tanks. He will also not face the laborious and costly task of collecting frys or fingerlings from the wild for his fish farming business. The collection of fingerlings can be done during the peak rainy seasons of July to September. The collection of both *Tilapia* and *Lates* Brood Stocks and fingerlings has been successfully demonstrated in Jigna – Eco farms in Abuja where I had my Internship experience. These species are as well suitable for cage culture as it is one of the most intense forms of aquaculture.

Table 3 expresses the potentialities of unconventional fish species revealed in the study. The species Found in the study area are also found in similar rivers of Tunga, Winki, Jangua, Asakio, Doma etc., as noted by the fishermen during sampling and identification.

L. coubie (African Carp) can be exploited more upon in respect to its biology for possible domestication like its exotic counterpart the *Cyprinus carpio* Linnaeus, 1758 which has been successfully domesticated. A study carried out on the biology of *L. coubie* at the Agbokim Waterfalls for 2 years by Ikpi, Jenyo-Oni and Offem (2012) [9] revealed a Standard Length (SL) of 9.0-22.2cm, Total Weight (TW) 38.2-619.6g and a Fecundity Range (FR) of 10,411- 24,143 Eggs.

P. *obscura* (snakehead) is considered an emerging species in Africa, with high consumer preference. Few bones, very fleshy, high in protein, medicinal properties, hardiness, rapid growth and tasty flesh. The *P. obscura* can reach a weight of 2g/day and a weight of 1.0kg within 4-5 Months. A study carried out on the biology of *P. obscura* in the Anambra River for one year by Odo, Onoja and Onyishi (2012) [10] revealed a Total Length (TL) of 23.4-28.5cm, Total Weight (TW) 86.0-140g and a Fecundity Range (FR) of 126- 1,580 Oocytes. This species is of significant aquaculture potential and should be fully exploited upon.

4. Conclusion

This research was a call necessary, with the discovery of Shale oil by biggest consumers of Nigeria's oil the USA and China and the falling oil price in the international market; new alternatives to oil must be conceived. The exploitation of our neglected aquaculture resources becomes necessary in order to engage comparative advantage in fish biodiversity, register progressive cultivability and establish sustainability of our most important resources. There is need for government, NGO, Communities, individual culturists and research institution to prioritize the utilization of our naturally endowed indigenous fish species as established by this research. Conventional and unconventional cultivable species should be properly exploited to expand and improve the proper utilization of indigenous fish species in the State and Nation.

To take advantage of this resource is to respond to one of the 21st century's most viable empowerment tool, Aquaculture. As well bridge the country's Aquaculture potential and register it support for food protein sufficiency in the States and across

Nigeria.

Thus, fish culturists, specialist teams (Biologists, Ecologists, Geneticists, etc.) in Governments, NGO and Communities both local and international should take advantage of this cultivable species in order to multiply and expand availability that will empower and create jobs as well support fish food protein sufficiency as this is the only panacea for fish food security in Nigeria, Africa and the Globe.

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