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Fish Families of Oguta Lake, South Eastern Nigeria, and Sustainability Issues

Amiye Francis[1]; Francis David Sikoki[2] and Uchenna Nwabata Agorua[3]
1. Dept of Animal Science & Fisheries. Faculty of Agriculture,Univ of Port Harcourt (Uniportt)
2.Dept of Animal and Environmental Biology. Uniport
3.Dept of Fisheries & Marine, Fac of Agric., Imo State Polytechnic, Umuagwo
*Corresponding author: amiye.francis@uniport.edu.ng

Abstract
Fish species of Oguta Lake were sampled for seven months to acertain present status. The catch consisted of 5 orders, 15 families, 21 genera and 28 species. Bagridae, Characidae, Anabantidae, Citharinidae and Notopteridae were dominant families in terms of numbers; in terms of species, Cichlidae was most dominant (5 species). In descending order number of species identified were: three each, for Mormyridae, Characidae and Mochokidae; and a species or two for each of the remaining 11 families, indicating that there could be high risk of complete wipe out of such families under sudden adverse environmental conditions. As a potential source of socio-economic development to surrounding communities the anthropogenic activities on this lake should be defined in order to forestall the gradual and continuous loss of its useful services. The root crop cassava (*Manihot* sp.) cottage industry can be sited by the lake to stop its direct processing within the lake. Domestic waste should not be dumped directly into the lake as well. The management of Oguta Lake is encouraged since this will curtail the negative impacts of anthropogenic activities on the lake aquatic resources through appropriate management approaches. Ecosystem - and community - based approaches, including integrated and adaptive management measures are suggested for the management of the lake and its aquatic resources, as there seemed to be some kind of shift, to a reduction in the lake fish assemblage.
Keywords: Anthropogenic activities, fish families, fisheries management, shift

1.0 Introduction

Fishery resources should play important role in the development of nations that are endowed with lots of natural marine and fresh water ecosystems like Nigeria since fishes are obligate aquatic organisms. Apart from being a cheap source of safe animal protein, fishery resources contain other essential nutrients required by the body Sikoki and Otobotekere (1999) for healthy living. It is generally accepted that fish yield in Nigeria is declining and that this is mainly due to environmental degradation and inadequate management of the fisheries resources (Jamu and Ayinala 2003).

Studies on fish fauna of Africa dated back to the early 1990s (Boulenger 1916). Fauna of various regions in Africa including Nigeria were identified and 1,425 species of fish classed into 44 families were recorded. In Congo basin, a region known for very high species richness and second only to the Amazon basin in this respect was reported to inhabit 25 families and 686 species (Teugels and Gugan, 1994).

Welman (1948) recorded 181 species of fish from the major river systems of Nigeria and Lake Chad, including estuarine and marine species which frequent the rivers. The freshwater inland fisheries of Nigeria is known to contain over 200 species, with 100 species reported for Lake Kanji, 87 for Lake Chad NARESCON (1992) and 85 for River Ogun (Sydenham, 1977). The Cross River harbours about 166 species (Teugels *et al*. 1992). Nwadukwe (1995) reported 17 families consisting of 23 species from two habitats that were identified within the Lagos lagoon and noted that six species appeared regularly. Alfred-Ockiya (1996) identified 28 families and 41 species in Kolo Creek, Rivers State. Other studies that have been reported include those of Odo *et al.* (2009) that reported 52 fish species that constitute 17 families, from the Anambra River.

Nwadiaro (1989) in a study on Oguta Lake, reported 19 families, with four families constituting over 90% in both number and biomass. Yem *et al*. (2011) reported 90 species from 25 families in seven Lakes across all the geographical zones of Nigeria. Udoidiong and King (2000) identified 55 species from 43 genera and 24 families from the fish fauna assemblages of two first order, two second order and one third order streams in Akwa Ibom State. Sikoki *et al*. (2008) reported 17 species that belong to 15 genera and 11 families from Onu-Iyi-Ukwu stream in South-eastern Nigeria.

Francis (2003) identified 63 fish species from 48 genera and 36 families, from the Andoni River brackish water system in the Niger Delta.

After more than 20 years of study by Nwadiaro (1989) on this Lake, it was needful once again to study the fish species composition of this Lake in order to have a picture of the occurrences in the ecosystem as a precursor to advising on the most efficient use of the Lake for socio-economic development.

2.0 Methodology

2.1 Description of the Study Area

Oguta Lake, also known as Ohamiri, is one of the inland fresh water drainage basins within South-eastern Nigeria. It lies approximately within Latitudes $5^0 41^1$ and 5^044^1 North and Longitudes $6^0 50^1$ and $6^0 45^1$ East. About linear in shape, the lake receives inputs from Rivers Njaba, Awbana and Orashi, while the fourth river, Utu flows in only during the rainy season (April to November). A relatively small and shallow water body, the water volume increases tremendously during the rains; its maximum surface area being $2.48Km^2$ with a depth of 9.30m (Ogidi and Nwadiaro 1988). The Lake is of immense value to the people of Oguta, Orsu, Nkwesi and Awo communities. This lake is the largest natural lake in South Eastern Nigeria; it is also a source of navigation and transportation, sightseeing and tourism, and a pool from which to obtain 80% safe and cheap animal protein and other indispensable nutrients for healthy living; thus contributing to the socio-economic development of the zone. On-going activities in the Lake include transportation by means of paddle and dugout canoe, or the use of engine-powered boats; peeling, washing and fermentation of cassava (a root crop); others include washing of clothes, cars, motor cycles and kitchen utensils, bathing, disposal of domestic wastes and fishing.

2.2 Sampling and identification of sampled fishes

Fish samples were collected once a month for seven months with the assistance of three artisanal fishing units. A plastic bucket with tight fitting lid, and containing 10% formalin was taken to the field for preservation of samples for further data collection. Keys by Reed *et al*. (1967), Anthony (1982), Olaosebikan and Raji (2013), Sikoki and Francis (2007) were used for identification of fishes to species level.

3.0 Result

3.1 Fish species of Oguta Lake

This study showed that there were 5 orders, 15 families, 21 genera and 28 species of fish in Oguta Lake within the 7 months of study. It was observed that in a descending order, Bagridae, Characidae, Anabantidae, Citharinidae, and Notopteridae were the dominant families in terms of number, see Table 2. Cichlidae had the highest number of species (5) occurring in the total sample but the majority of the fish families (11) were represented, either by one or two species, while three families had three identified species each, see Table 1.

4.0 Discussion

Lake fisheries, like marine, coastal or river fisheries have gone through periods of boom and decrease in catch, and have been associated with loss in biodiversity, eutrophication, and alien species invasion (Jia *et al*. 2013). It is possible that Oguta lake is experiencing loss of biodiversity in terms of its fishery resources because Nwadiaro (1989) identified 19 fish families as opposed to 15 in present study. However, two fish families recorded in current study Anabantidae and Hepsetidae were not reported by Nwadiaro (1989), while Tetraodontidae, Malapteruridae, Centropomidae, Ophiocephalidae, Lepidosirenidae, Carangidae, Pomadasyidae and Mugilidae (8 families) were reported by Nwadiaro (1989) but not in present study. In the Nwadiaro (1989) report, 4 families constituted over 90% of catches both in number and biomass; the order of descending dominance being Citharinidae, Cichlidae, Characidae and Bagridae. It is to be noted that the four dominant families acknowledged by Nwadiaro (1989) are still the dominant families obtained in present study, either in number of captured individuals or number of species. The observation that the number of families seemed to decrease; but with a consistency in the dominant families, indicate that the short sampling period of seven months could have resulted in exclusion of some families. Further, it can be indicative of the slow rate of anticipated change in the lake system, including effects of climate change and the negative impacts of too many anthropogenic activities within the lake as enumerated under the section of study area. Yem *et al.* (2011), in their studies on fish species richness and peculiarities of seven lakes from all the geographical zones of Nigeria reported a total of 90 species from 25 families. According to the Yem *et al. (2011) report*, Asejire had the highest number of species (41) while the lowest was recorded for Opi (13) and Oguta had the highest number of families (17), the lowest being Tiga (eight). The result of Yem *et al*. (2011) points to the fact that the number of fish families in Oguta lake may be hovering around twenty. A longer period of study, therefore, could verify the true situation.

According to Trumpickas *et al.* (2012) fish biodiversity can shift over time though the shift may not be clearly related to factors such as increased water clarity, macrophyte growth or benthic invertebrate communities. The aspects of the said shift was in terms of species richness, number of captured individuals, and Simpson's diversity index in lake Simcoe, Canada.

A trend that was observed in lake fisheries in China was a transition from wild fisheries to stock-enhanced fisheries using assorted types of aquacultural practices(Jia *et al.*, 2013). With the benefit of hindsight therefore, any considered measure to boost sustainable exploitation of the fisheries resource on the Oguta lake should consider environment friendly practices that will ensure restoration and conservation of the aquatic biota, and the ecosystem and its services. Another observation on lakes generally, is that seasonality and shallowness of water

level does not reduce the profitability of contributing to socio- economic development of surrounding communities (Njaya *et al.,* 2011). According to Guo *et al*. (2013), the necessity of managing shallow lakes for more benefits is usually reflected in food web structure and ecosystem analysis, an aspect not considered in this study.

The practice of managing lakes is not novel, however, erstwhile neglected approaches such as ecosystem-based approach, adaptive management, community-based and integrated management approaches must be integrated into any plan that is envisaged for the sustainable exploitation and use of Oguta lake and its fishery resources. Suggestions on the management approaches is premised on the fact that all the available services from the lake and its biota, should as much as possible be preserved for envisaged generations. That being the case, the interest of the different types of stakeholders (transporters, eco-tourists, entrepreneurs, conservationists, biologists, subsistent and artisanal fishers, community members etc.), therefore, would have to be protected. The ecosystem approach will take care of interests of the biologist, conservationist and eco-tourists ; the adaptive management will address issues raised by the biologist after research, while the community - based management approach would be a platform through which the surrounding communities will participate in management and be effective agents to enforce agreed regulations on the lake usuage. Through the integrated management approach, opportunity would be created at a round table for various professionals to chart the best use of the lake and its resources for the greater benefit of the larger populace.

5.0 Conclusions

From this study, it can be concluded that Oguta Lake has about five dominant fish families (viz; Bagridae, Characidae, Anabantidae, Citharinidae and Notopteridae in terms of number; but six by including Cichlidae, for species richness).

The number of fish families in the lake could be around 20 and this can be confirmed through longer study periods.

Decrease in number of the fish families may be caused by climate change, slow rate of anticipated change and negative impacts of too many anthropogenic activities on the Oguta lake.

6.0 Recommendation

There should be longer period of study on Oguta Lake so as to confirm the present number of species, genera and families in the lake.

Some of the on-going activities should be prohibited such as the disposal of domestic waste into the lake. Cassava processing plant can be established close to the Lake for use by the women processors, and waste from such processing plant properly disposed off and not indiscriminately dumped into the lake.

The suitability of the water parameters for fish production should also be analyzed.

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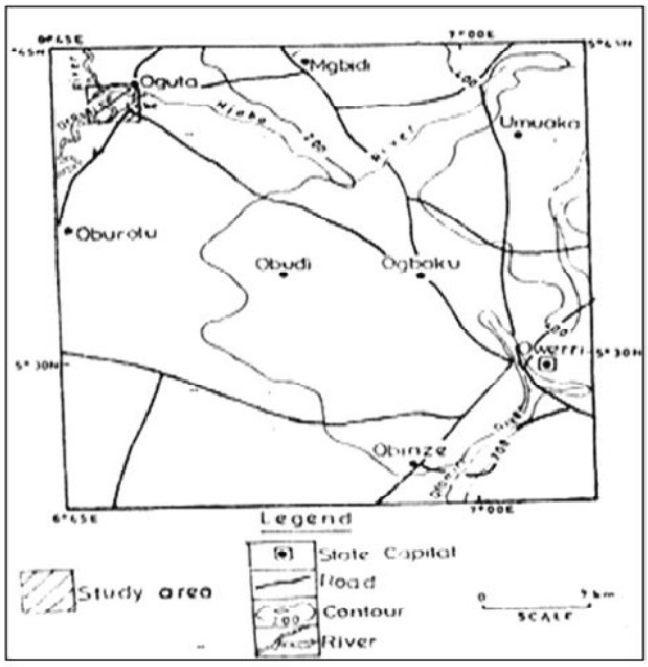

Figure 1. Location Map of Study Area
Source: Source: Adapted from Ahiarakwem *et al*. (2012)

Table 1: Checklist of fish species of Oguta Lake, South East Nigeria, June to January, 2013

Order	**Family**	**Genus**	**Species**
Osteoglossiformes	Mormyridae	*Mormyrops*	*Mormyrops deliciosus* (Leach, 1901)
		Marcusenius	*Marcusenius senegalensis* (Steindachner, 1870)
		Petrocephalus	*Petrocephalus bane ansorgii* (Boulenger, 1902)
	Notopteridae	*Papyrocranus*	*Papyrocranus afer* (Gunther, 1868)
	Polypteridae	*Polyterus*	*Polyterus senegalus senegalus* (Cuvier, 1829)
			Polyterus bichir bichir (Geoffrey Saint-Hilaire, 1802)
	Osteoglossidae	*Heterotis*	*Heterotis niloticus* (Cuvier, 1829)
	Gymnarchidae	*Gymnarchus*	*Gymnarchus niloticus* (Cuvier, 1829)
Characiformes	Citharinidae	*Citharinus*	*Citharinus citharus* (Geoffery Saint Hilaire, 1809)
	Characidae	*Alestes*	*Alestes brevis* (Boulenger, 1903)
		Hydrocynus	*Hydrocynus forskalii* (Cuvier, 1819)
			Hydrocynus brevis (Gunther, 1864)
Siluriformes	Cyprinidae	*Labeo*	*Labeo senegalensis (*Valenciennes, 1842)
	Schilbeidae	*Siluranodon*	*Siluranodon auritus* Geoffrey Saint-Hilaire, 1827)
		Schilbe	*Schilbe mystus* (Linne, 1758)
	Clariidae	*Clarias*	*Clarias anguillaris* (Linne, 1758)
	Bagridae	*Chrysichthys*	*Chrischthys nigrodigitatus* (Lacepede, 1803)
			Chrysichthys auratus (Geoffery Saint-Hailaire, 1808)
	Mochokidae	*Synodontis*	*Synodontis nigrita* (Valenciennes, 1840)
			Synodontis membranaceus (Gunther, 1864)
			Synodontis budgetti (Boulenger, 1911)
Cypriniformes	Hepsetidae	*Hepsetus*	*Hepsetus odoe* (Bloch, 1794)
Perciformes	Anabantidae	*Ctenopoma*	*Ctenopoma kingsleyae* (Gunther, 1896)
	Cichlidae	*Tilapia*	*Tilapia mariae* (Boulenger, 1899)
			Tilapia galilaea (Linne, 1758)
			Tilapia zilli (Gervais, 1848)
		Chromidotilapia	*Chromidotilapia guntheri* (Sanvage, 1882)
		Hemichromis	*Hemichromis elongatus* (Guichenot, 1861)

Table 2: Percentage contribution of fish families of Oguta Lake, South East Nigeria

Families	Number Caught	% Total Number Caught
Mormyridae	17	1.85
Notopteridae	38	4.14
Polypteridae	8	0.87
Osteoglossidae	2	0.22
Gymnarchidae	2	0.22
Citharinidae	45	4.90
Characidae	265	28.90
Cyprinidae	17	1.85
Schilbeidae	15	1.64
Clariidae	7	0.76
Bagridae	374	40.79
Mochokidae	23	2.51
Hepsetidae	20	2.18
Anabantidae	69	7.52
Cichlidae	15	1.64
Totals 15	917	100

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