THE ICHTHYOFAUNA OF ELEMI RIVER, NIGERIA: A PRELIMINARY PRE-IMPOUNDMENT SURVEY

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Abstract: A preliminary survey of the pre-impoundment population of the fish in lower river Elemi, prior to the establishment of the Ekiti State University (EKSU) power plant was carried out during the rainy season, from June to August, 2015. The stretch of this river is sparsely inhabited by three species of fish. A total of 523 fish were caught during the study from three locations (proposal Site A, B and downstream). This includes tilapia, *Oreochromisniloticus* (13.58%); the snakehead fish; *Parachannaobscura* (16.83%) and the catfish, *Clariasgariepinus* (69.98%), all belonging to the families Cichlidae, Channidae and Claridae respectively. *Clariasgariepinus* was the dominant fish species. The result of this survey showed that the river has low fish species composition and abundance. There was no serious fishing activity going on, on this river, except for occasional sport fishing by the nearby residents. Scarcity of many different fish species in this river may warrant introduction of relevant fish species to the proposed man-made lake in order to obtain maximum benefit from the reservoir. There is also need to evolve strategies for proper management of the proposed power plant for maximal utilization for power generation and optimum fish production.

Keywords: Downstream, upstream, power plant, fish, relative abundance

Introduction

In Nigeria, the problem of electric power supply is enormous and is being solved through construction of dams across rivers to generate power and consequently water supply. Rural development is within the framework of the United Nations Millennium Development Goals (MDGs) and rural electrification is a must, as Nigeria pursues her Millennium Development Goals. The present government's vision of positioning Nigeria as one of the top twenty (20) economies in the world by the year 2020 can only be achieved as power is made readily available.

To improve power supply and in its bid to become a world-class institution, Ekiti State University, Ado Ekiti, looks beyond being connected to the national grid for electricity supply. The institution is proposing to establish a small hydroelectric power project on campus to ease electric power requirement of the campus and its environs. Statistics have it that the institution now accommodates over 50,000 students, apart from the staff and other members of the community (http://www.zoominfo.com/p/Patrick-Aina/1322376693), hence, the need for expansion. Aribisala (2013) reported that the said river could hold a small hydro power plant delivering about 5.03MW of power, far above the 1.2MW which by his estimates is currently needed by the University.

The benefits derivable from this project are enormous and cannot be quantified in economic terms only. The comfort and social developments associated with regular and uninterrupted power supply makes it a laudable venture. In lieu of this development, it is expedient to carry out the pre-and post–impoundment impact assessment of this installation on the ichthyofauna diversity (downstream, upstream and the impoundment area) of the fish.

In an effort to solve the problem of power supply, reservoirs are constructed and the ecosystem is disturbed and there is great impact on the flora and fauna of the river body/course. Great succession of fish and other aquatic organism populations occur and sometimes there is loss of biodiversity.

Fish play important roles in the diet of the people of developing nations (Adewumi, 2011). It is a very rich source of cheap animal protein with low cholesterol content. The need for increase in locally available fish to satisfy a population of 176 million, growing at a rate of 3.1% yr$^-$,is becoming expedient. Nigeria is blessed with abundant natural aquatic resources in marine, estuarine and fresh water environment. The fresh water bodies of Nigeria, with over 270 fish species, are the richest in fish diversity in West Africa (Tobor, 1992). Inspite of this endowment, Nigeria is the largest importer of frozen fish in the world, with a fish demand of between 106,200-128,052 metric tonnes year^{-1}, out of which only 0.5MT is produced. The fish yields of most Nigeria inland waters are generally on the decline for causes that may range from inadequate management of the fisheries to degradation of the water bodies. Sustainable exploitation requires knowledge of the ichthyofaunal composition in the water bodies. There is also the need to harness every sources of fish production, of which this proposed reservoir could be one. According to Miranda (1999), reservoirs can provide significant contribution to global fisheries, but the effectiveness of their contribution depends largely, on adequate fish assemblage and proper management of the reservoir fisheries. Hence the need to assess the fish stock in Elemi River before the proposed establishment of a reservoir. This project is thus a preliminary survey of the pre-impoundment ichthyofauna of River Elemi, prior to the establishment of the power plant.

Material and Methods
The Study Area
Elemi River (Fig. 1) is located along the Ekiti State University, Ado-Ekiti road in Ekiti State, Nigeria. It lies between latitude 7045'N and 5020'E of the equator. Ado-Ekiti is the capital town of Ekiti State in the Southwestern Nigeria.
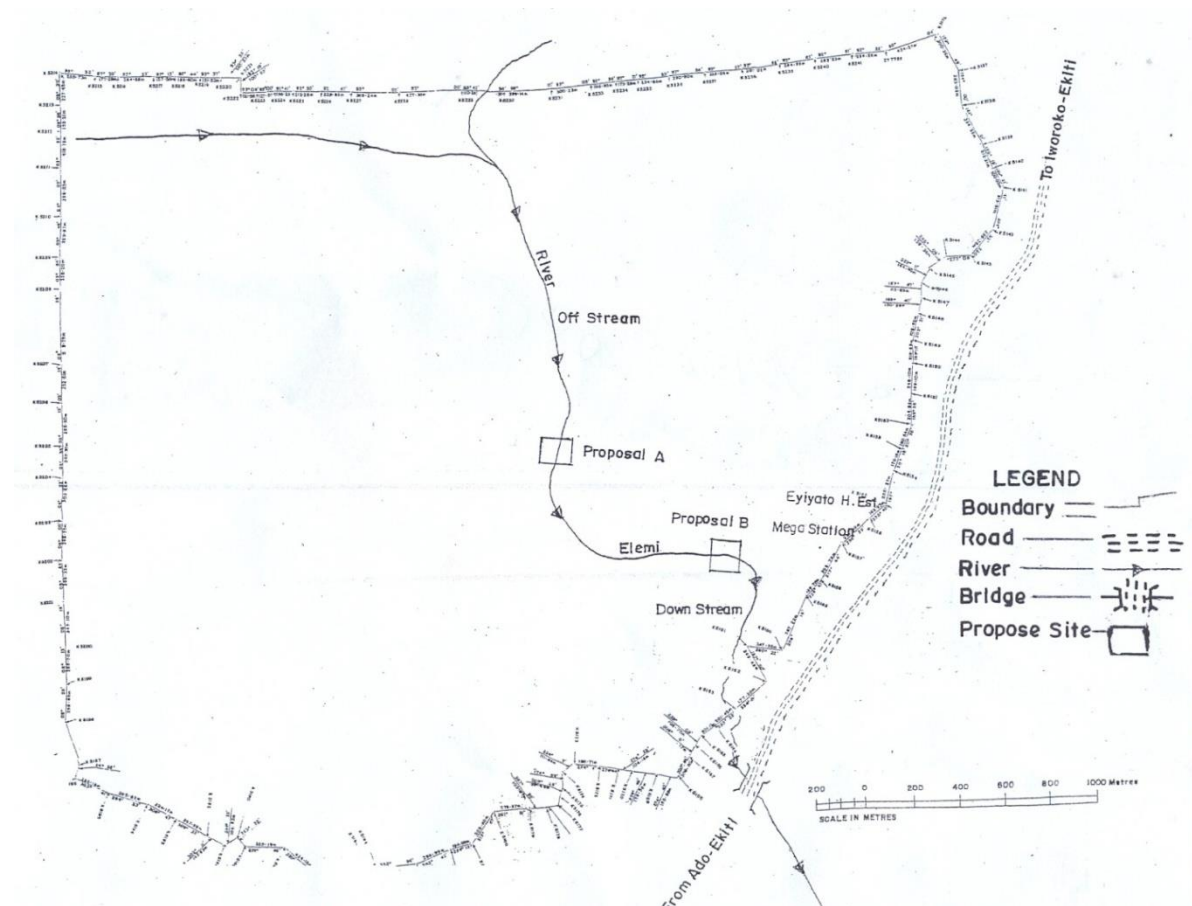
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Fig. 1: Map of Ekiti State University land, showing Elemi River and the proposed project site.

The river takes its source (Fig. 2) from River Elemi in Igede-Ekiti which itself was said to take its source from the popular River Osun, in Oshogbo, Osun State. This river is located on a plane and is surrounded by a dense stretch of vegetation and agricultural farm. The river runs across the major road leading to Iworoko-Ekiti along which the University is situated. Aribisala (2013) reported that the project area covers an approximate area of 2.2 km^2, with the possibility of extending services to a neighbouring area of equivalent land mass. Climate is characteristically tropical. Mean monthly rainfall varies from 45 to 225 mm. Temperature is typically hot and reasonably uniform at 32°c $\pm$ 3 throughout the year. Relative humidity is as high as 95% in wet season and 45% in the dry. Estimated evaporation rate is 1527.6 mm per km^2 per day.

Fig. 2: The source of the river at Igede-Ekiti, Nigeria

Fish sampling

Three sampling stations (proposed site A, B and downstream) (Fig. 1) were selected along the lower reach of the river Elemi. Monthly sampling was carried out for a period of three months (June-August). A uniform fishing effort of two fishermen for 4hours duration per day (7.00-11.00 h) was maintained throughout the study period. The gears and methods used were in accordance with the recommendations of Gullard (1980), that reliable sampling should involve a combination of two or more gears. On each occasion, harvesting of the fish was done twice monthly using hook and line and set nets (5-15 mm), as appropriate. The fish harvested were identified on the site and classification done using the identification guides of Maddison (1992), Babatunde and Raji (1998) and Idodo-Umeh (2003).

Data analysis

All fish species collected were counted to determine species abundance. The relative abundance (%) of each species was calculated by the formula of Benech *et al*. (1983):

$$R.A = \frac{S.A}{T.A} \times 100$$

Where R.A. = Relative abundance of each species;
  S.A. = Species abundance
  T.A. = Total Abundance for all species

The relative dominance of each species, over the months, was also determined qualitatively according to the criteria of Meye and Ikomi (2008):

$\geq$10% = dominant
1-9% = sub-dominant
<1 (but caught more than once) = occasional
<1% (and caught only once) = rare

Results and Discussion

The fish fauna sampled in Elemi River and the monthly relative abundance are shown in Table 1. A total of 523 fishes of 3 species, belonging to 3 families (Clariidae, Cichlidae, and Channidae) were recorded in this study. The highest number of fish species relative percentage and abundance were observed in the family Clariidae (67.82%), followed by Channidae (20.69%) and Cichlidae (11.49%). In terms of the

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species population index (Table 1), *Clariasgariepinus* (Burchell, 1822) was the dominant species, followed by *Parachannaobscura* (Teugels and Daget, 1984). *Oreochromisniloticus* was the sub-dominant species.

The primary objective of a sampling survey of this nature is to attempt to find out what fish species exist in the river and perhaps look at the factors governing their abundance. The description of any fish community is a biased image arising from the sampling of a group of fishes in a particular environment at a given time. The use of gear and sampling strategies are the usual source of these biases (Meye and Ikomi, 2008).

The influence of habitat or water quality variable on fish can determine abundance. The high volume of water during the sampling period which rainy season is also probably responsible for the low species abundance (Oso and Fagbuaro, 2004). Land use and other human activities influence fish species diversity and abundance in water bodies (Victor and Dickson, 1998). This is probably applicable here. The water course immediately upstream has a free course but the three locations selected for this study were puddles created by fallen logs of wood. These regions have become muddy in comparison to the immediate upstream region. This probably gives the mudfish an advantage of survival and dominance. The cichlids, on the other hand, prefer lacustrine conditions and good water quality. Moreover, the thriving of the carnivorous Parachannasp and omnivorous clarias must have limited the usual proliferation of tilapia species, thus leading to imbalance in forage/carnivore ratio. Nwadaro, 1998 reported that a balanced population is that in which the ratio of forage to carnivorous (F/C) species ranges between 4:1 and 10:1. Thus, in order to have a realistic strategy for maximal exploration of the fish population in the proposed reservoir, there should be adequate fish assemblage, as well as balanced F/C population ratio.

The relatively low species composition in this study, compared to other similar studies, with high species richness, such as in Orogodo River, Nigeria, (Nwadaro (1998) could be due to the use of multiple gears in those sites. Allison *et al.* (1997) suggested a multiple gear approach as the best way to obtain comprehensive ichthyofauna samples for such studies. Anthropogenic activities in this area flanked by some residential houses include home gardening, horticulture, block making industry and even a mechanic workshop. These might also affect species abundance. As *Clariasgariepinus*, belonging to the family Clariidae, was recorded as the most abundant species here; Ezenwani (2004) and Adewumi *et al.* (2015) also observed similar trend of high abundance of this species in the lower Anambra River and Ogbese River, respectively.

Table 1: Fish fauna in Elemi River, showing monthly abundance from June, 2015 – August, 2015

Family/Species	June	July	August	Total	Index Score
Clariidae					Dominant
C. gariepinus	177	122	67	366	Dominant
Cichlidae					Occasional
O. niloticus	30	26	32	88	Occasional
Channidae					Occasional
P. obscura	54	15	02	71	Occasional
Total	**261**	**161**	**101**	**523**	

This study is in agreement with Ikomi and Sikoki (1998) in terms of numbers of families and species, but vary in kind of species. The highest monthly relative abundant catch was recorded in June while the least was recorded in August (Fig. 3). As the amount of rainfall increases, the volume of the water increases. This made harvesting more difficult.
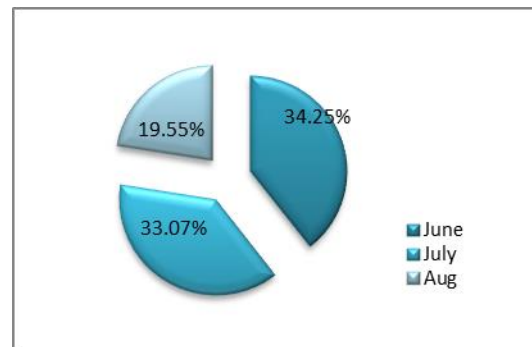

Fig. 3: The monthly relative abundance of the fish fauna of Elemi River

Only three species were sampled during the period of study. This does not mean that there are no other species in Elemi River. The other fish species may not have been caught due to the type of gear used. Ufodike*et al.* (2001) reported that hooks and net are essential in maximizing fish catch. Moreover, research time frame, which has not taken care of seasonal variations may also account for this.

Conclusion

The preliminary investigation into the fish fauna of the lower Elemi River revealed the presence of three types of fish, *Clariasgariepinus*, *Parachannaobscura and Oreochromisniloticus* belonging to three families, Clariidae, Cichlidae and Channidae, respectively. *Clariasgariepinus* was the dominant species while *Oreochromisniloticus* was the sub-dominant species. Scarcity of fish species in this river may warrant introduction of relevant fish species to the man-made lake in order to obtain maximum benefit from the reservoir. There is also need to evolve strategies for proper management of the proposed power plant for maximal utilization for power generation and optimum fish production. It is hoped that by the time the sampling is done all year round, a more comprehensive picture of the population dynamics will be obtained. This knowledge is essential to maximizing the utilization of the proposed reservoir for electricity generation, as well as fish production.

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