CICHLID ABUNDANCE AND DISTRIBUTION IN THE GREAT KWA RIVER, NIGERIA

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ABSTRACT

Cichlids are well distributed within the Neo-tropical and Afro-tropical bio-geographic zones. In Afro-tropics, they are found to be widespread in freshwaters including rivers, streams, lakes and dams. In this study, the general objective was to examine their relative abundance and distribution in the Great Kwa River, Nigeria. A one-year monthly sampling for cichlids was undertaken from November 2017 to October 2018 with local traps, hook and line as well as multi-mesh gillnets that ranged between 30 mm to 80 mm. Relative abundance and t-distribution test were used respectively to examine the abundance and distribution of cichlid species in the two sites of the river. Results showed that a total of 587 individual cichlids were caught from Esuk Anantigha (60.99%) and Esuk Atu (39.01%). Species collected include Oreochromis niloticus (45.14%), Tilapia zillii (36.46%) and Chromidotilapia guntheri (18.40%) in order of abundance. Independent t-test revealed significant seasonal and spatial disparities in relative abundance and distribution at P<0.01. Higher cichlid abundance was observed during dry season with distribution skewed towards Anantigha station. Thus, there is need to control anthropogenic activities in the area to ensure sustainable biodiversity and conservation of aquatic resources.

Key words: Relative abundance, species distribution, cichlids, freshwater, Great Kwa River

INTRODUCTION

Cichlids are well distributed within biogeographic zones of the tropics including the Neo- and Afro-tropics. In Afro-tropical countries like Nigeria they are found to be widespread in freshwaters including rivers, streams, lakes and dams. According to Cabej (2019), up to 3000 fish species ore more have been described worldwide from the family Cichlidae making them the largest group among the vertebrates. Of these, at least 1100 cichlid species have been reported in Africa (Stefanie et al., 2019) with only 12 species in Nigeria (Olopade and Dienye, 2018). Although most species especially ornamental cichlids are found in East Africa notably Lake Malawi, Lake Victoria and Lake Tanganyika, West Africa is competitively a repository of cichlid species (Kinyage and Lamtane, 2018). Cichlids are noted for their very active swimming and feeding behaviours. They are also aggressive in nature and can be territorial, especially during mating. Cichlids eat a variety of food materials in their natural habitats including plants, insects, detritus, fish eggs/larvae and other smaller fishes, algae, phytoplankton and zooplankton. While some species are strictly specialists, others eat more than one food category, others are opportunistic feeders. Fish abundance in their habitats is as a results of food availability and abundance as well as the types of substrate of that habitat (Greshishchev et al., 2015). According to Olopade and Dienye (2018) habitat use by some fish species especially cichlids including feeding, resting and reproduction is strongly correlated with spatial and temporal changes in habitat conditions such as physicochemical parameters. Habitat stability also depends on ecosystem structure which is determined by the types of interaction whether predation, mutualism or competition among co-species (Mougi and Kondoh 2012).

In terms of human activities, the major threats to river systems throughout the world as observed by Joadder et al. (2015) and Galib et al. (2018) are pollution, destruction of supporting riparian, alteration of flood plain...
ecosystems, invasive alien species, overexploitation of biotic resources and climate change. The Great Kwa River, an important river that supports the livelihood of the Calabar people through fisheries and non-fisheries activities has been overtime subjected to constant anthropogenic pressure ranging from dumping of untreated wastes to unregulated sand mining as well as overexploitation of the riparian vegetation. This could be responsible for declining fish populations. On this note, the present study is designed to examine the abundance and distribution of cichlids between major landing sites of artisanal freshwater fishery of the Great Kwa River, Cross River State, Nigeria.

Study Area
The Great Kwa River is a major tributary of the Cross River Estuary. Other sister tributaries are the Calabar, Cross and Akpa Yafe Rivers. According to Akpan (2000), the Great Kwa River flows in southward direction from the popular hills at Oban in Aningeje community, Southern Cross River State, Nigeria and discharge into the Gulf of Guinea through the Cross River Estuary roughly at latitude 4°45’N and longitude 8°20’E (Akpan, 2000). The eastern coast of the Calabar municipal L.G.A. is drained by the lower reaches of the river (Fig.1). Human activities within the river include fishing, sand mining, farming, lumbering. Calabar does not have standard waste treatment facility, as such untreated waste are dumped directly into the river which could affect biodiversity.

Collection of Samples
Fish samples were collected from two stations – Atu (Station 1) and Anantigha (Station 2). A 12-month fish sampling which took place from November 2017 to October 2018 using local traps, hook and line as well as multi-mesh gillnets that ranged between 30 mm to 80 mm.

Fig. 1: Map of Great Kwa River indicating the two sampling stations (Atu and Anantigha). Source: Eyo et al. (2013)

Fresh fish samples collected from the field were preserved in ice chest and transported to the Zoology and Environmental Biology Laboratory, University of Calabar, Nigeria. In the laboratory, species were identified according to Froese and Pauly (2017). The
identified fish specimens were further grouped and counted. Data were recorded in spreadsheets and saved for statistical analysis.

**Statistical Analysis**
Data were analysed using “ecostat” indices such as relative abundance and independent t-distribution test which examined respectively the abundance and distribution of cichlids in the two sites of the river.

**RESULTS AND DISCUSSION**
Results showed that a total of 587 individual cichlids belonging to three species of different genera were caught during the study (Table 1). More abundance was recorded in Esuk Anantigha (60.99%) than Esuk Atu (39.01%). Species collected include *Oreochromis niloticus* (45.14%), *Tilapia zillii* (36.46%) and *Chromidotilapia guntheri* (18.40%) in order of abundance. Monthly distribution of cichlids obtained during the study showed that *O. niloticus* and *T. Zillii* were recorded throughout the months of study, whereas *C. guntheri* was observed only in seven months from November 2017 to May 2018 which could have been the reason for the lowest abundance as it accounted for only 18.40% of the total catch. *O. niloticus* had its peak in February, *T. zillii* in December while *C. guntheri* peaked in January (Fig. 2). The observed abundance of cichlids in the dry seasons could be due to less turbid water status of the Great Kwa River in period of less or no rain. This could be attributed to the fact that cichlids are more associated with clear than turbid waters as reported in the work of Kinyage and Lamtane (2018). Habitats with high water transparency increases visibility and foraging abilities of the cichlids, hence high preference contrary to turbid habitats. The present findings also support the previous record of Allin *et al.* (1999) who reported relationship of fish diversity and density with water clarity.

**Table 1:** Percentage distribution of cichlids in the Great Kwa River, Nigeria (November 2017 to October 2018)

<table>
<thead>
<tr>
<th>Station/Species</th>
<th>Esuk Anantigha</th>
<th>Esuk Atu</th>
<th>Pooled data</th>
<th>Tcal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td><em>Oreochromis niloticus</em></td>
<td>159</td>
<td>27.09</td>
<td>106</td>
<td>18.06</td>
</tr>
<tr>
<td><em>Tilapia zillii</em></td>
<td>133</td>
<td>22.66</td>
<td>81</td>
<td>13.80</td>
</tr>
<tr>
<td><em>Chromidotilapia guntheri</em></td>
<td>66</td>
<td>11.24</td>
<td>42</td>
<td>7.16</td>
</tr>
<tr>
<td>Total</td>
<td>358</td>
<td>60.99</td>
<td>229</td>
<td>39.01</td>
</tr>
</tbody>
</table>

*Significantly different at P<0.01, t-distribution in table of values=2.2
CONCLUSION

The study on the abundance and distribution of cichlids in the Great Kwa River has revealed significant seasonal and spatial disparities (P<0.01, T-test) in cichlids prevalence in riverine systems. Higher relative abundance was recorded in the dry season while higher density was observed in Anantigha than Atu station. The study therefore recommends controlled anthropogenic activities in the area to ensure sustainable biodiversity and conservation of aquatic resources.

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