

FISH SPECIES COMPOSITION AND DISTRIBUTION IN FISHING COMMUNITIES ALONG OGUN RIVER BASIN, SOUTHWEST, NIGERIA

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ABSTRACT

The rate of overexploitation, pollution, habitat destruction, climate change, invasive species, and disease outbreaks in inland waters pose significant threats to biodiversity, underscoring the need for comprehensive research on freshwater ecosystems. Monitoring the diversity, abundance and richness of species in these ecosystems is crucial for assessing their status and stability. This research aimed to develop a comprehensive catalogue of fish species in Ogun River, facilitating ongoing monitoring of endangered or extinct species. The catalogue will provide a vital baseline for conservation and management efforts, promoting the long-term sustainability of the river's ecosystem. This study was carried out along Ogun River basin, for nine months from December 2019 to August 2020, in five fishing communities (Oyan, Alamutu, Lafenwa, Oriyanrin, Akomoje) based on their level of fishing activity. Data were collected through experimental field record of fish species across five landing sites with each site sampled on monthly basis with minimum of three canoes assessed in each location for their catches. The catches were sorted and identified into species using standard fish identification keys. Results revealed that, Twenty eight (28) fish species from 16 families were found in Ogun River, with family Cichlidae accounting for the highest proportion (32.1%), followed by the families Mormyridae (10.7%), Alestidae (7.1%), and Anabantidae (7.1%). Of the 28 fish species, only eight (28.6%) were evenly distributed across all locations. An examination of the fisheries value chain in Ogun River revealed that despite the critical roles played by various stakeholders, their participation in the formulation and implementation of policies guiding fisheries activities was remarkably low. This is particularly disturbing given the actors' intimate familiarity with the river's ecosystem. The findings of this study underscore the urgent need for sustainable management practices to conserve the fisheries resources of Ogun River. Gear restriction, closed season/area, number of fishermen per trip, diversification of fishers into aquaculture and non-fisheries activities were strongly recommended to conserve the fisheries resources of the River.

INTRODUCTION

Fish is a major and affordable source of animal protein to about 4.3 billion people,

giving up to 15% of their animal protein and essential nutrients for growth and maternal health. The sector contributed about \$24

billion, which is 1.26% of the Gross Domestic Product (GDP) of all African countries in 2011 (de Graaf and Garibaldi, 2014). Fisheries is one of the most reliable sub-sectors of agriculture that contribute significantly to the nation's GDP through agriculture (Federal Department of Fisheries - FDF, 2007). The significance of fisheries in a country extends beyond its economic contribution to GDP. Fisheries resources and products play a vital role in providing food, employment and income, while also influencing the country's culture, traditions and way of life (Adeosun, 2012).

Fish, apart from being a very affordable source of protein necessary for human nutrition, also serves an important role in the development of a nation (FAO, 2020). It is a very good source of other essential nutrients required by the body. The medicinal purposes served by fish cannot be overemphasized due to its ability to replenish the human body with vitamins A and D; calcium, phosphorus and lysine; sulphur and amino acids (Adeosun, 2019). Hence, studies about fish abundance and distribution are important in order to improve fishery management and conservation (Adeosun, 2019). The freshwater ecosystem, despite its remarkable biodiversity and diverse array of plant and animal species, is facing an alarming threat in the loss of its fish population. This is a pressing concern, as the decline in species richness in freshwater ecosystems far exceeds that of most terrestrial ecosystems, highlighting the urgent need for conservation efforts (Adesulu et al., 2002).

Over-exploitation of the resource is another major threat as fish plays a vital role in human and animal nutrition, providing large proportion of the populace, the essential animal protein and also trickle up the econ-

omy of any nation (Worldfish, 2018).

Several studies have been carried out on the biodiversity of various inland waters of Nigeria. Although previous studies (Adeosun, 2012; Odulate, 2010) have investigated the diversity, abundance and fin fish assemblage of different water bodies, recent activities around and within the water are thought to have altered the species composition. In view of the dynamic nature of activities around this water body, there is need to carry out frequent researches into the biodiversity of the fisheries resources so as to provide up-to-date information that will assist fisheries managers in making policies that can protect the fisheries and also educate the farmers on the state of the fisheries resources of the water. Knowledge of the taxonomy and distribution of fish of any water body is necessary in assessing its productivity and permit a better understanding of the population and life cycle of the fish community in the presence of environmental stress such as low dissolved oxygen, high temperature and high ammonia. Additionally, there is paucity of evidence-based data on the species composition and seasonal distribution of fish in Ogun River.

This study was therefore designed to determine the fish resources of upper and lower Ogun River, with special focus on composition, abundance and diversity.

MATERIALS AND METHODS

Study Area

This study was conducted in Ogun River, located in Ogun State, Nigeria. As one of the major rivers in south-western Nigeria, Ogun River spans a total area of 22.4 km². Its flow rate varies significantly between seasons, with approximately 393 m³/sec during the wet season and 120 m³/sec during the dry

season (Osunkiyesi, 2012). Ogun River originates in Oyo State at coordinates 3°28' E and 8°41' N, flowing southwest through Ogun State before emptying into the Lagos Lagoon in Lagos State at coordinates 3°25' E and 6°35' N (Osunkiyesi, 2012). The river's water is utilized for various purposes, including agriculture, aquaculture, transportation, human consumption, industrial ac-

tivities, and domestic use. However, its water quality is compromised by the constant influx of effluents from breweries, cattle markets, slaughterhouses, textile and dyeing industries, tanneries, and domestic waste water. The surrounding area, approximately 100 km², has a population of around 3,637,013 people and an average elevation of 336 meters above sea level (Osunkiyesi, 2012).

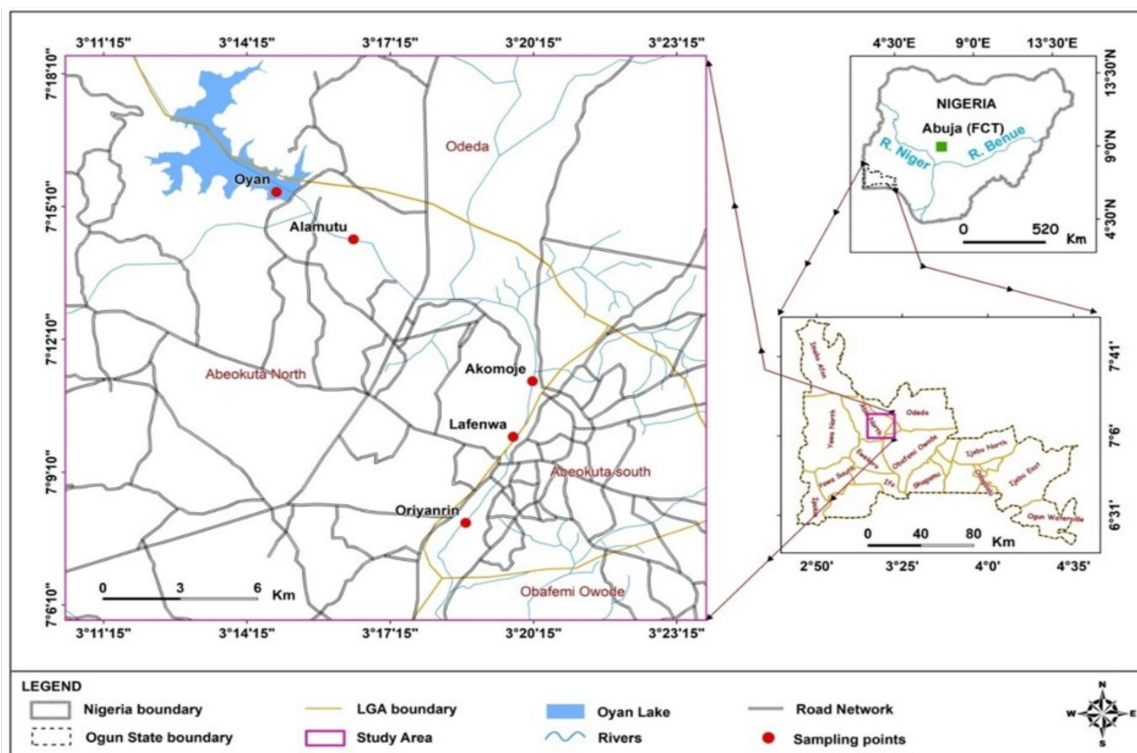


Fig. 1: Map of Ogun River and the study locations

Population of the Study Area

The study population consisted of all the fisher folks in artisanal fishery in Ogun River.

Sample size and sampling techniques

A two-stage sampling procedure was adopted in this study. The first stage entailed the purposive sampling of five fishing commu-

nities (Oyan, Alamutu, Lafenwa, Oriyanrin, and Akomoje) in the study area based on intensity of involvement in different fishery value chain. The second stage involved the use of simple random sampling in the selection of 50 % of the fisher folks and this resulted in a total sample size of 77 actors (Table 1).

Table 1: Sampling technique and sample size of the study area

Location	Sampling frame	Sample size (50%)
Oyan	100	50
Alamutu	24	12
Lafenwa	18	9
Oriyanrin	8	4
Akomoje	4	2
Total	302	77

Data collection procedure

The research commenced with a frame assessment by visiting fishing communities within the study area. The essence of the visits was to be familiar with the fishermen, their activities and practices. During the visits, opinion leaders who guided in the compilation of sampling frames were identified. Direct observation and visual survey was used to identify and conduct enumeration of all the coastal fishing communities

Collection of samples

Data were collected through experimental field record of fish species across five (5) landing sites. The survey was carried out using a multi-gear fisheries by assessing the commercial landings of fishermen from the five landing sites. Survey was carried out with the involvement of registered member fishermen of the artisanal group in the study area. Landing sites were visited once a month for a total period of ten months (five months in the dry season – November, to May; and five months in the wet season – June to October). Monthly catches were sorted into species, using the catalogue developed by Olaosebikan and Raji (2013).

Data Analysis

All data obtained from this study for the catch landing were coded, entered into the Microsoft Excel software package, and thereafter exported into the Statistical Package for Social Sciences (SPSS 20.0). Diversity indices such as Simpson's index, Shanon Weiner, Dominance were used to determine the diversity, richness and evenness of fish catch during the study period. These were determined using the PAST 4.03 software.

RESULTS***Fish species composition in Ogun River***

The scientific, common and family names of the different fish species caught in Ogun River during the study period were compiled (Table 1). A total of 28 fish species from 16 different families were found in River Ogun, with the family Cichlidae accounting for the highest proportion (32.1%) of the species, followed by the families Mormyridae (10.7%), Alestidae (7.1%), and Anabantidae (7.1%) while the remaining 12 families have only one species each (Table 1).

Table 1: Composition of fish species in Ogun River by Family

S/No	Scientific name	Common name	Family
1	<i>Brycinus leuciscus</i>	African tetra	Alestidae
2	<i>Hydrocynus forskahlii</i>	Tigerfish	Alestidae
3	<i>Ctenopoma kinslayae</i>	Spotted climbing perch	Anabantidae
4	<i>Ctenopoma petherici</i>	Climbing perch	Anabantidae
5	<i>Chrysichthys nigrodigitatus</i>	Silver catfish	Bagridae
6	<i>Lates niloticus</i>	Nile perch	Centropomidae
7	<i>Chana obscura</i>	Snakehead fish	Channidae
8	<i>Oreochromis niloticus</i>	Nile tilapia	Cichlidae
9	<i>Coptodon zilli</i>	Red-belly tilapia	Cichlidae
10	<i>Tilapia marie</i>	Spotted tilapia	Cichlidae
11	<i>Oreochromis mossambicus</i>	Red tilapia	Cichlidae
12	<i>Hemichromis fasciatus</i>	Banded jewel fish	Cichlidae
13	<i>Chromidotilapia guntheri</i>	Gunther's mouthbrooder	Cichlidae
14	<i>Coptodon dageti</i>	African mouthbrooders	Cichlidae
15	<i>Oreochromis aureus</i>	Blue tilapia	Cichlidae
16	<i>Tilapia moxambicus</i>	Black tilapia (Mozambique tilapia)	Cichlidae
17	<i>Clarias gariepinus</i>	Common catfish	Clariidae
18	<i>Chrysichthys auratus</i>	Golden Nile catfish catfish	Claroteidae
19	<i>Gymnarchus niloticus</i>	African knife fish	Gymnarchidae
20	<i>Hepsetus odoe</i>	African pike characin	Hepsetidae
21	<i>Malapterurus electricus</i>	Electric catfish	Malapteruridae
22	<i>Synodontis sp</i>	Dwarf lake fish/ upside down	Mochokidae
23	<i>Mormyrus rume</i>	Elephant snout	Mormyridae
24	<i>Marcusenius deboensis</i>	Elephant fish	Mormyridae
25	<i>Hyperopisus bebe</i>	Elephant fish	Mormyridae
26	<i>Notopterus nigri</i>	African brown knife fish	Notopteridae
27	<i>penaeid Shrimps</i>	Prawn	Penaeidae
28	<i>Schilbe mystus</i>	African butter fish	Schilbeidae

Fish distribution by study locations

Of the 28 species observed, only eight (28.6%) were found in all the locations: *Coptodon zillii*, *Chrysichthys auratus*, *Chrysichthys nigrodigitatus*, *Clarias gariepinus*, *Coptodon dageti*, *Hepsetus odoe*, *Lates niloticus* and *Momyrus rume* (Table 2). *Oreochromis aureus*, *Oreochromis dageti* and *Penaeid Shrimps* were found in Oyan but not in other locations. *Hydrocynus*, *Hyperopisus bebe*, *Malapterurus electricus* and

Marcusenius deboensis were found in all locations but not in Oyan. Also, *Chromidotilapia guntheri*, *Ctenopoma kinslayae*, *Gymnarchus niloticus* and *Hemichromis fasciatus* were found in only Lafenwa while *Oreochromis niloticus* and *Schilbe mystus* were found in all locations but Lafenwa. *Brycinus leuciscus*, *Chana obscura* and *Ctenopoma petherici* were found in Lafenwa and Oyan (Table 2).

Table 2: Fish distribution by study locations

Fish species	Lafenwa	Oyan	Oriyanrin	Akomoje	Alamutu
<i>Coptodon zillii</i>	1	1	1	1	1
<i>Brycinus leuciscus</i>	1	1	0	0	0
<i>Parachana obscura</i>	1	1	0	0	0
<i>Chromidotilapia guntheri</i>	1	0	0	0	0
<i>Chrysichthys auratus</i>	1	1	1	1	1
<i>Chrysichthys nigrodigitatus</i>	1	1	1	1	1
<i>Clarias gariepinus</i>	1	1	1	1	1
<i>Coptodon dageti</i>	1	1	1	1	1
<i>Ctenopoma kinsleyae</i>	1	0	0	0	0
<i>Ctenopoma petherici</i>	1	1	0	0	0
<i>Gymnarchus niloticus</i>	1	0	0	0	0
<i>Hemichromis fasciatus</i>	1	0	0	0	0
<i>Hepsetus odoe</i>	1	1	1	1	1
<i>Hydrocynus forskahlii</i>	1	0	1	1	1
<i>Hyperopisus bebe</i>	1	0	1	1	1
<i>Lates niloticus</i>	1	1	1	1	1
<i>Malapterurus electricus</i>	1	0	1	1	1
<i>Marcusenius deboensis</i>	1	0	1	1	1
<i>Momyrus rume</i>	1	1	1	1	1
<i>Notopterus nigri</i>	1	0	0	1	1
<i>Oreochromis aureus</i>	0	1	0	0	0
<i>Oreochromis dageti</i>	0	1	0	0	0
<i>Oreochromis niloticus</i>	0	1	1	1	1
<i>Penaeid Shrimps</i>	0	1	0	0	0
<i>Oreochromis mossambicus</i>	0	0	1	1	1
<i>Schilbe mystus</i>	0	1	1	1	1
<i>Synodontis sp.</i>	0	0	1	1	1
<i>Tilapia mariae</i>	0	0	0	1	1
Number of species	20	16	16	18	18

1: Presence of fish species, 0: Absence of fish species

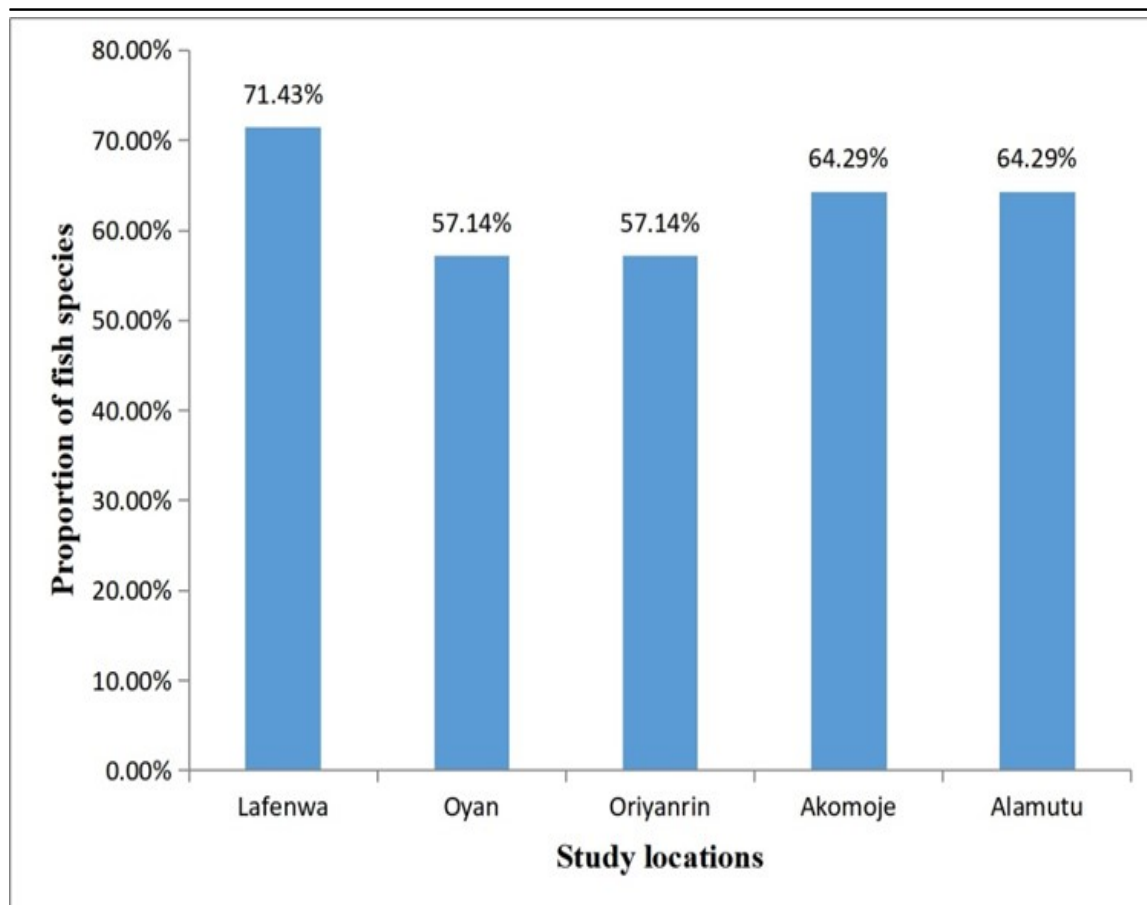


Figure 2: Percentage distribution of fish species in the study locations

Seasonal distribution of fish species

Notopterus nigri and *Tilapia mariae* were found in the wet season only (Table 3). *Lates niloticus* and *Synodontis sp.* were found in

the dry season only while majority (24) of the fish species was found in both dry and wet seasons (Table 3).

Table 3: Distribution of fish species by season

Wet season	Dry season	Both seasons
<i>Notopterus nigri</i>	<i>Lates niloticus</i>	<i>Coptodon zillii</i>
<i>Tilapia mariae</i>	<i>Synodontis</i>	<i>Brycinus leuciscus</i>
		<i>Parachanna obscura</i>
		<i>Chromidotilapia guntheri</i>
		<i>Chrysichthys auratus</i>
		<i>Chrysichthys nigrodigitatus</i>
		<i>Clarias gariepinus</i>
		<i>Coptodon dageti</i>
		<i>Ctenopoma kinslayae</i>
		<i>Ctenopoma petherici</i>
		<i>Gymnarchus niloticus</i>
		<i>Hemichromis fasciatus</i>
		<i>Hepsetus odoe</i>
		<i>Hydrocynus forskahlii</i>
		<i>Hyperopisus bebe</i>
		<i>Malapterurus electricus</i>
		<i>Marcusenius deboensis</i>
		<i>Momyrus rume</i>
		<i>Oreochromis aureus</i>
		<i>Oreochromis dageti</i>
		<i>Oreochromis niloticus</i>
		<i>Penaeid Shrimps</i>
		<i>Oreochromis mossambicus</i>
		<i>Schilbe mystus</i>

DISCUSSION

The present study revealed a total of 28 fish species from 16 families in Ogun River, raising questions about the river's biodiversity richness. While this number may seem relatively high compared to other rivers in Ogun and south-western states, it is essential to consider the potential factors influencing the variation in species richness. Previous studies conducted in Ogun River reported a higher number of fish species, with

Adeosun (2012) recording 34 species from 13 families and Ajagbe et al. (2021) reporting 41 species belonging to 13 families. The disparity in species richness between these studies and the present study may be attributed to various factors, including differences in sampling methods, locations, and periods. Additionally, environmental factors such as habitat degradation, pollution, and climate change may have contributed to the decline in species richness. Notably, the family Cich-

lidae dominated the fish species in the present study, accounting for approximately one-third of the total species. This finding is consistent with previous studies (Davies, 2009; Odulate, 2010; Bello-Olusoji et al., 2010; Obe and Jenyo-Oni, 2011; Emmanuel and Osibona, 2013; Abdul et al., 2019; Adeosun, 2019; Famoofo and Abdul, 2020), which reported the dominance of fish species from families Cichlidae, Mormyridae, Alestidae, and Anabantidae in various river bodies across Nigeria.

The fish composition in Ogun River exhibited a notable diversity of species across various families. One of the prominent families, Bagridae, was represented by three distinct species, highlighting the richness of this family in the river. In addition to Bagridae, five other families; Channidae, Mochokidae, Clariidae, Alestidae, and Malapteruridae each had two species present in the river. This representation underscores the significant contribution of these families to the overall fish diversity in Ogun River. Furthermore, four families - Arapaimidae, Hepsetidae, Centropomidae, and Schilbeidae - were each represented by a single species. Although these families had a relatively lower representation, their presence adds to the overall biodiversity of the river. The distribution of fish species across different landing sites and seasons was also noteworthy. Over 25% of the fish species were recorded in all the landing sites, indicating a widespread presence of these species throughout the river. This finding suggests that certain species are adapted to thrive in various environments within the river. Moreover, the majority of fish species were found in both wet and dry seasons, suggesting that the river supports a relatively stable fish community throughout the year. This stability is likely due to the river's ability to provide a consistent habitat for

various fish species, despite seasonal changes in water levels and flow. Bagridae family was represented by 3 species, while each of Channidae, Mochokidae, Clariidae, Alestidae, and Malapteruridae family had 2 species representation and likewise each of Arapaimidae, Hepsetidae, Centropomidae, and Schilbeidae had 1 species representation in the fish composition. The variation in fish family representation in the Ogun River Basin is driven by habitat adaptability, environmental factors, feeding strategies, human activities, and reproductive traits. More adaptable and resilient families, like Bagridae and Clariidae, have higher species representation, while specialized or sensitive families, like Arapaimidae and Centropomidae, are less represented. This highlights the need for sustainable fisheries management to conserve biodiversity, maintain ecosystem balance, and protect vulnerable species from environmental threats. Also, more than one-quarter of the fish species were recorded in all the landing sites, and the bulk of the fish species were found in both wet and dry seasons.

CONCLUSION

This study investigated the fish species composition in Ogun River, Southwest Nigeria. The findings revealed a total of 28 fish species from 16 families, with the Bagridae family being represented by three species. Despite the relatively high species richness, the study highlights the need for conservation efforts due to the impact of human activities on the river's ecosystem. The results from this study are consistent and in agreement with previous findings that reported the dominance of fish species from the families Cichlidae, Mormyridae, Alestidae, and Anabantidae in Nigerian rivers. However, the species richness recorded in this study is lower than the previously reported species

from different studies, suggesting a potential decline in fish biodiversity of the study area. The spatial distribution of fish species across the landing sites showed some variation, but the distribution did not vary significantly by season. This suggests that the river supports a relatively stable fish community throughout the year.

RECOMMENDATION

To address the potential decline in fish biodiversity and prevent resource depletion, this study recommends the introduction of fisheries conservation policies which should include measures such as closed season/area, stocking/recruitment of fish species, and gear restriction. Implementing these policies would help prevent over-exploitation, improve the richness of the water body, increase the growth rate and size of fish species, reduce fishing intensity, and prevent the extinction of important fish species. The successful conservation of Ogun River's fish biodiversity requires the cooperation of stakeholders, including fishermen, policymakers, and conservation organizations to protect the long-term sustainability of this vital ecosystem.

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