

AN ANALYSIS OF NIGERIAN FRESHWATER FISHES: THOSE UNDER THREAT AND CONSERVATION OPTIONS

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ABSTRACT

The study assessed qualitatively the threat status of all Nigerian freshwater fishes using such criteria as rarity, size at maturity, mode of reproduction, human population density, habitat degradation, pollution and range of each species among others. The biology of 48% (129n) of Nigerian freshwater species is not well known. Of the 266 known freshwater fishes, 47 species representing 17% are critically endangered, 15 (5%) are endangered, 8 (3%), are vulnerable while 23 (8%) are near threatened. The paper suggests increased basic knowledge of threatened species and conservation policy along three lines public awareness, legislation and creation of national parks, aquaria and reserves as measures needed to ensure the conservation of these fishes.

INTRODUCTION

The fish fauna of Africa (Nigeria inclusive), compared to other aquatic organisms, is fairly well known at conventional taxonomic levels. However, the status of these rich biodiversity in term of conservation have not been extensively studied and documented (Abban, 1999). Much attention of fisheries management and research in Nigeria focuses on species that are important in capture fisheries and aquaculture with little or no concern for other 'coarse' species. Meanwhile fishes have been recognized as the most threatened among all vertebrates worldwide (Bruton, 1995). Thus not much is known about the biology of many Nigerian freshwater fishes while what is known about the others are found to be hidden in not too accessible grey literatures and student theses. This has hampered our understanding of the biodiversity of inland waters except for large water bodies and those close to higher institution of learning with research capability. Whereas diversity of community of living aquatic organisms is important for productivity, stability (resistance and resilience) and aesthetics of inland systems (Welcome, 2001).

Apart from the work of Teugels *et al* (1992) on the taxonomy, zoogeography, ecology and conservation of the fishes of Cross River basin and fishes consumed as food in some Lakes, Reservoirs and Rivers. there is no country wide assessment of the status of each species of Nigerian fishes to make valid opinion on whether they are endangered or not. It is against this background that a qualitative assessment of Nigerian freshwater fishes as contained in Olaosebikan and Raji, (1998) were made using criteria that have been tested by Froese and Torres' (1999) analysis of the threatened fishes of the world contained in the 1996 IUCN Red list. This preliminary study is important to raise conservation awareness pending the time a comprehensive nationwide survey can be conducted on our freshwater fish resources.

The aim of this paper therefore, is to highlight the status of Nigerian freshwater fish species in view of their immense contribution to biodiversity, fishers' economic well being and livelihood as well as to give conservation options to save this source of livelihood from the precipice.

MATERIAL AND METHODS

The checklist of Nigerian freshwater fishes contained in Olaosebikan and Raji, (1998) was used while biological information were taken from Welman (1948), Daget (1954), Reed *et al*

(1967), Reid & Sydenham (1979), Teugels et al (1992), Leveque et al., 1991 & 1992) and FishBase 2003.

The following criteria were used to classify fish into threat status:

1. When a fish is declared rare, uncommon, occasional in old literatures such as Welman (1948), Daget (1954), Reed et al (1967), Reid & Sydenham (1979), more than 30 years ago, their status now can best be imagined and so is classified as threatened.
2. Large, slow growing and late maturing fish: fish like *Arius gigas* belong to this group and has been classified on this basis by Daget et al., (1988).
3. Fish with special habitat needs. For instance such fishes like *Garra waterloti*, *Chiloglanis* that requires fast flowing streams and annual fishes like *Nothobranchius* that are found in temporary pools of the arid zone of Nigeria. The statuses of these fish habitat presently are used as basis for classifying them. Since a threat to their habitat is a threat to such fish.
4. Fishes that depend on the environment for their eggs and larvae development are more susceptible than those that have some degree of parental care.
5. The human population density of a fish distribution range. Froese & Torres (1999) has shown that there is a negative relationship between human population density and percentage of threatened fishes. This is as a result of increased pressure on the natural resources in term of food, fuel wood, deforestation, urbanization and increase discharge of waste and pollution into the environment.
6. A fish that is recently described. Such fishes are usually rare and so were not discovered in the day of scientific explorations of nineteen and early twentieth century. In this study fishes described in the sixties are considered lowest while those in the nineties are highest on endangered scale. For instance some aquarium fish like *Aphyosemion deltaense* (1976), *Fundulopanchax scheeli* (1970) *F. powelli* (1994), *Epiplatys biafranus* (1970) *Nannocharax latifasciatus* (1989), *Neolabias powelli* (1990).
7. Fish with restricted distribution that is endemic to a small part of the country or found only in the country. E.g. *Dagetichthyes lakdoensis*, a flatfish restricted to upper Benue, *Gobiocichla ethelwyannae* identified from a stream 8km downstream of Manfe on the Cross River, *Procatopus similis* is restricted to Cross Rivers, while *Nothobranchius rubroreticulatus* is found only in Chad basin area but not in the Lake.
8. Fish important in aquarium trade are also vulnerable to extinction as a result of indiscriminate collection (Daget et al., 1988).

Any fish belonging to three or more of the above criteria is termed critically endangered (CR); those with two criteria are termed Endangered (EN) while one criterion is termed vulnerable (VU) to being endangered and near threatened (NT).

RESULTS AND DISCUSSION

Table 1 shows the checklist of freshwater and some anadromous brackish water species that usually ascend rivers. Of the 266 known freshwater fishes, 47 species representing 17% are critically endangered, mostly in the order Cyprinodontiformes (Killifishes) in which 15 species are endangered. Table 1 shows the relative number of threatened fishes among the known freshwater fishes of Nigeria. Table 2 shows the breakdown of threatened fishes by level of threat. The freshwater fish species of Nigeria is the richest in West Africa, with 266 described presently (Olaosebikan & Raji, 1998; Leveque et al., 1991). Surprisingly enough, the basic biology of 47% (128n) of them is not well known yet. Blackbox models that require only limited knowledge of individual commercially important species are still used for making fisheries management decisions (FAO, 1997). Fishes, apart from providing food, and employment are important in recreation such as sport and ornamental fisheries. They are also symbolical culturally and traditionally. Despite their importance economically, and socially, fishes have received less attention compared to wildlife and plants. Presently there is no fish protected under national laws.

Table 1: Nigerian freshwater fish species under threat by order

ORDER	TOTAL NUMBER	NUMBER THREATENED
Rajiformes	1	1
Lepidosireniformes	1	0
Polypteriformes	5	2
Clupeiformes	6	2
Osteoglossiformes	4	2
Mormyriiformes	35	7
Gonorychiformes	2	2
Characiformes	43	11
Cypriniformes	30	9
Siluriformes	72	21
Cyprinodontiformes	31	25
Perciformes	47	7
Mastacembeliformes	5	1
Pleuronectiformes	1	1
Tetraodontiformes	2	1

Table2: Threat status of Nigerian freshwater fish species

Order	No CR	No EN	No VU	No NT	Total threatened
Rajiformes	1	0	0	0	1
Lepidosireniformes	0	0	0	0	0
Polypteriformes	0	1	1	0	2
Clupeiformes	0	1	0	1	2
Osteoglossiformes	0	2	0	0	2
Mormyriiformes	3	0	0	4	7
Gonorychiformes	0	2	0	0	2
Characiformes	7	1	1	2	11
Cypriniformes	7	1	0	1	9
Siluriformes	4	6	1	10	21
Cyprinodontiformes	22	1	3	0	25
Perciformes	2	0	1	4	7
Mastacembeliformes	1	0	0	0	1
Pleuronectiformes	1	0	0	0	1
Tetraodontiformes	0	0	1	1	2

Key: CR – Critical endangered

EN – Endangered

VU – Vulnerable

NT – Near threatened

Unfortunately, fishes have been recognized as the most threatened among all vertebrates worldwide (Bruton, 1995). The present result of critically endangered fishes is similar to that obtained by IUCN (1999). In their report, an estimated 17% of freshwater fish species in 20 countries for which assessments were most complete are classified in the IUCN Red List of threatened fishes faced with extinction.

Threat status of Nigerian freshwater fishes by order

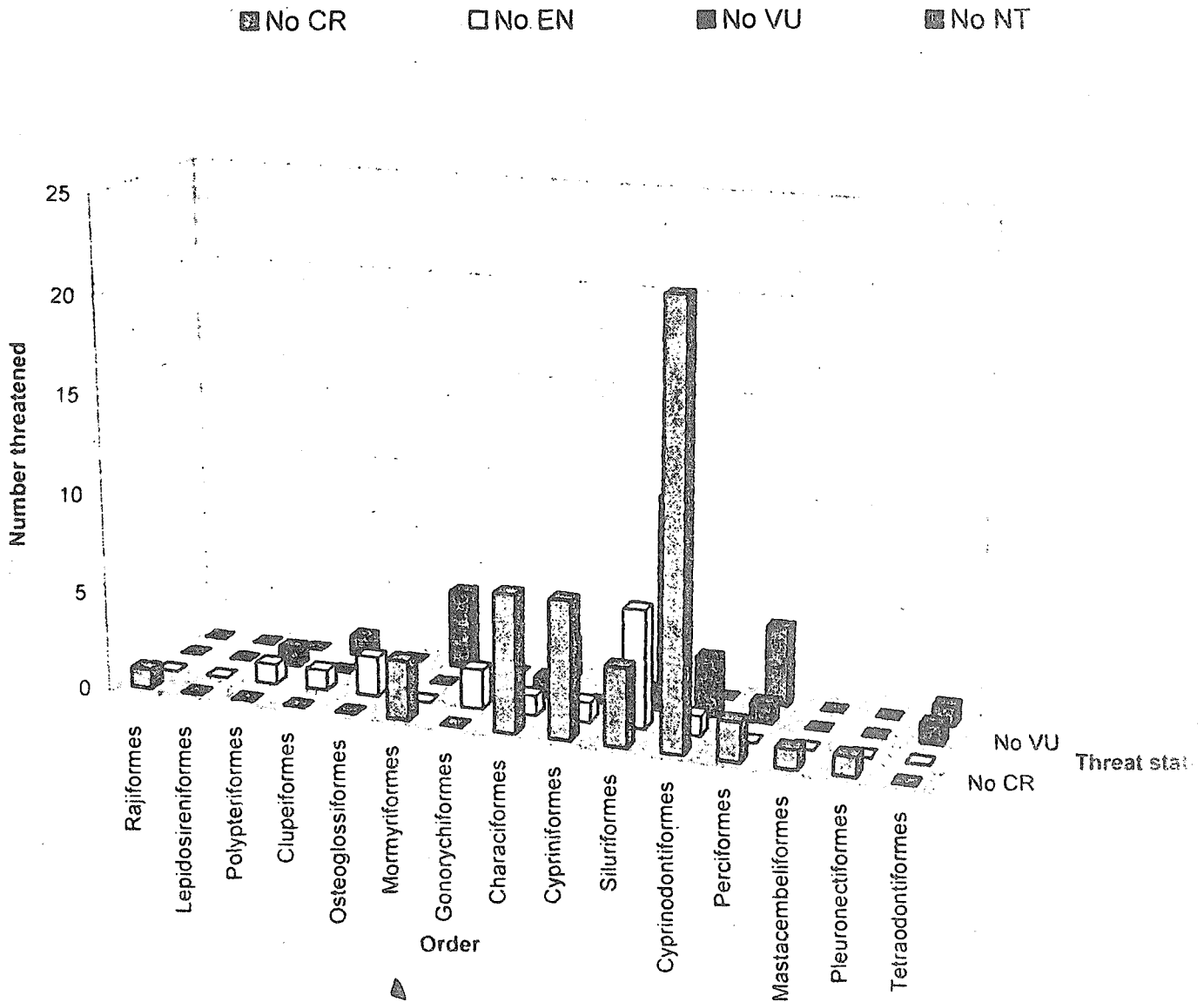


Fig. 1:Threat status of Nigerian freshwater fish species

Rajiformes the single species (*Dasyatis garouaensis*) in this order that is found in the freshwater is critically endangered in its range in Nigeria. As a result of the creation of the Kainji and Jebba Dams this fish is now restricted to waters of the Niger River below these dams

Polypteriformes –*Polypterus bichir* is classified as being at risk because it is found only in Lake Chad while *Erpetoichthys calabaricus* is threatened by human population density, habitat degradation and collection in aquarium trade.

Osteoglossiformes Of the four species in this order two, *Pantodon buchholzi* and *Xenomystus nigri* are endangered and vulnerable respectively. This is due mainly to wild collection for aquarium trade and the impact of high human population density on *Pantodon* distribution range as well as habitat degradation.

Mormyriiformes One member is critically endangered and endangered at National level and one is found to be vulnerable.

Gonorynchiformes represented by two species in different families, *Cromeria* is critically endangered and *Phractolemus* is vulnerable.

Characiformes *Bryconaethiops* is critically endangered. *Arnodichthys*, *Rhabdalestes brevidorsalis*, *Alestes macrophthalmus*, *Brycinus intermedius*, *Ichthyoborus besse* *I. monodi*, *Nannocharax latifasciatus*, *Nannaethiops*, *Neolabias axelrodi*, *N. powelli* are all vulnerable

Cypriniformes – *Garra waterloti* and *G. trewavasae* are endangered while *Leptocypris crossensis*, *Barboides gracilis*, *Barbus sylvaticus*, *B. lauzannei* are vulnerable

Siluriformes Species critically endangered here include *Chrysichthys aluuensis* which was described in 1985 and found in the oil polluted New-Calabar and Imo rivers, *Parauchenoglanis akiri* described in 1987 and restricted to Imo and New Calabar Rivers, *Doumea thysi* described in 1989 and restricted to Cross Rivers, *Arius gigas* (One specimen of this fish was reported caught in September of 1972 by Lewis; (1972) during which a number of juveniles were caught from many parts of Kainji Lake and ever since none has been reported again. This mouth brooding fish grows to a very big size of up to 2 metres and reaches sexual maturity late. The most probable problem of this fish is that the juveniles are big enough to be caught by fishers before they attain sexual maturity. Fishes vulnerable in this order are *Leptoglanis camerunensis*, a very small fish of 23mm in length, *Pareutropius buffei* collected for aquarium trade, *Amphilius atesuensis* and *Chiloglanis benuensis* restricted to Benue River. According to Ezenwaji (1999), *Clarias agboyensis* is at risk due to overexploitation.

Endemism: 46 species of Nigeria freshwater fish are endemic to the country. Out of these number 34 are Critically endangered, 3 Endangered, 3 Vulnerable, 7 Near threatened. This is in comparison to thirty-two species of freshwater fish of Philippines contained in the 1996 IUCN Red List, out of which 22 are endemic (Capuli & Froese, 1997).

Habitat degradation

Many of these fishes are declining in abundance as a result of over fishing, dams construction, loss of catchments, habitat disruption and destruction as well as industrial and agricultural pollution. Habitat degradation and destruction through human activities have often been the underlying factor responsible for the decline and extinction of freshwater fish species rather than direct overexploitation (Maitland and Morgan, 1997)

Pollution Most of the fish species from Niger Delta are in one way or the other threatened by pollution. The mangrove of the Niger Delta (7,292km²) is the least studied in the world (Wilcox & Powell, 1985). It is even adjudged to be the largest mangrove stand in Africa (Kinako, 1977). The mangrove swamp and the freshwater swamp forests of the coastal region of Nigeria are estimated at 28,000km² (Edwards, 1986). These ecosystems have been seriously impacted by human activities in the past twenty-five years. It is even adjudged to be the largest mangrove stand in Africa (Kinako, 1977). The mangrove swamp and the freshwater swamp forests of the coastal region of Nigeria are estimated at 28,000km² (Edwards, 1986). These ecosystems have been seriously impacted by human activities in the past twenty-five years. There are more than 32 species of killies found in Nigeria; of these twenty occur in the mangrove

swamps and freshwater forests of the south. Of these twenty, eight are endemic to the Niger Delta. (*Aphyosemion deltaense*, *Fundulopanchax sjoestedti*, *F. arnoldi*, *F. filamentosum*, *Epiplatys biafranus*, *E. longiventralis*, *Micropanchax scheeli*, *Foerschichthys nigeriensis*). Killifish being small and of little value to the local communities presently, can easily become extinct without being noticed. These fish lives in habitats like weedy parts of streams, rivers, swamps, marshes and seasonal/ temporary pools that are easily affected by environmental perturbation.

In Nigeria, the threat of oil pollution started in the 70s when between 1972 and 1980, 836 oil spill incidents were recorded resulting in 1,405,406 barrels of oil polluting the environment. Between January and May 1981 alone, 121 spills were recorded (Awobajo, 1981). Within twenty-three years the rate of oil spillage has assumed an alarming proportion as a result of increase in oil exploration, illegal bunkering, vandalization and ethnic unrest in the Niger Delta. Presently it is impossible to keep record of the spills except for large scale ones that are publicized in the newspapers. To worsen the problem very little ecological impact assessments are conducted when spillage occurs, most work are either sponsored by the affected communities or the oil company involved in order to get or give compensation as the case may be. Such reports are either distorted to favor those concerned or in most cases classified as secret, thus becoming inaccessible to scientific scrutiny. One of the few studies that was done in depth is the Oshika spill of 1983. It was reported that only fish with air-breathing organs were found seven months after the spillage while non-air-breathers that did not survive include *Hemichromis*, *Thysochromis*, Mormyrids, *Hepsetus*, *Alestes*, *Neolabias*, several cyprinodonts and *Polycentropsis* (Powell, 1986). It is known that crude oil contain toxic compounds like aromatic and naphtheno-aromatic hydrocarbons while those that are not toxic form films on the water surface, on soil and the body of the plants and animals. This results in serious asphyxiation and for such soil spawners like the *Fundulopanchax* it meant mass mortality for both the eggs that have been deposited in the substratum and the spawners. This definitely leads to reduce recruitment when there are survivors or total extermination of the species in such habitat.

Surprisingly, the 1996, IUCN (International Union for Conservation of Nature) Red list of endangered species does not include any Nigerian Freshwater species, Does it mean none of them is on the verge of extinction considering the rate of habitat degradation as a result of increase in human activities, population and poverty in the past 30 years of oil boom and doom.

The threat of ornamental fish trade cannot be quantified presently but it is common knowledge elsewhere the role of wild collection of aquarium fishes to extinction in wild. An example is the Golden dragon (*Scleropagus formosus*), which under CITES the trade and export of it is restricted to few licensed farmer to forestall wild collection (Bartley, 2000). Thailand. In Africa. Nigeria is the number one exporter of ornamental fish to Europe and America. a situation that is indicative of the threat. For most of these fish being harvested, their status in the wild in term of stock structure and life histories are not well known In Nigeria with some fish still being described as recent as 1994 and with the level of conservation effort, it seems probable that some fish may become extinct before being described at all. This is buttressed by Froese and Torres' (1998) study of 1996 IUCN Red list which showed that there is a steady increase in the percentage of threatened fishes in relation to their year of description. According to their finding of all fish described before 1800, 31 are threatened while of those described after 1950, 246 are threatened. This led to Froese and Torres' (1998) observation that conservation measures need to be based on sound knowledge of the species in question.

Only 11% of the threatened freshwater dependent fishes in the IUCN Red List are protected, indicating a lack of recognition of the problem by national governments and fishery managers (Froese and Torres, 1998).

Nigeria needs to:

- Put in place an endangered species act that will include fishes and other aquatic organisms as we have for wildlife.
- Identify critical sites for the conservation
- Determine key threatening processes

Reserves, parks sanctuaries and other types of protected areas may be used for wide variety of objectives, including nature conservation, recreation or sustainable use (IUCN, 1994) Globally, the principle of establishing aquatic reserves for fish has been reinforced by the convention on Biological Diversity and by Ramsar's decision that the conservation of fish species alone is sufficient to justify the setting up of a Ramsar site (Welcomme, 2001). Traditionally conservation measures such as prohibition of fishing in designated water body or portion of it for traditional or religious value should be identified, scientifically studied and made into heritage sites. Breeding grounds of fishes should be identified and designated as conservation reserves or sanctuaries. Specific man-made biotopes can be constructed for the annual fishes (e.g. *Nothobranchius* and *Pronothobranchius*) in the Lake Chad National Park and other arid wetland areas for the conservation of these fishes.

Public awareness has been recognized as an important tool for mobilizing popular opinion, generating and sustaining appropriate action, political and funding support within and globally (Raymond, 1999). According to Robinson, (1993) public awareness and education are critical for promoting sustainable development and improving the capacity of the people to address environmental and developmental issues. United Nations Conference on Environment (UNCED) in Agenda 21, UNESCO, Convention on Biodiversity (CBD) article 13 all recognized the importance of public awareness in conservation and protection of the environment. In Nigeria, such public awareness can include the establishment of Public aquaria, there is need to identify specific conservation objectives. These can be sold to national and state policy makers to provide moral action at the state and national levels, gain media interest enlist the support of Non-governmental organization such as Nigeria Conservation Foundation (NCF). Presently it only concerns itself with wildlife and forest conservation.

The Nigerian government should be encouraged to ratify the Code of Conduct for Responsible Fisheries (FAO, 1995). The FAO Code of Conduct for Responsible Fisheries was produced in response to global concern over the clear signs of over-exploitation of fish stocks throughout the world and to recommend new approaches to fisheries management which included conservation, environmental, social and economic considerations.

In Nigeria there is substantial work to be done in the conservation of inland freshwater fish resources. These include establishing the status of each species in a geographical area, identifying the conservation needs of the endangered ones and implementing appropriate measures of protection as soon as possible.

The protection of aquatic habitats of major importance must be regarded as the prime long-term objective of any conservation programme.

There is an urgent need for a national fish survey to assess the current status of freshwater species.

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