POTENTIALS FOR SUSTAINABLE FLOOD PLAIN FISHERIES DEVELOPMENT: A CASE STUDY OF TATABU FLOOD PLAIN

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Abstract

This study presents evidence from a case study of an ecological appraisal of Tatabu flood plain aimed at formulating management approaches for the enhancement of the fishing communities social, economic and cultural realities. Tatabu flood plain is located north of Jebba and at high water the ecosystems cover about 700 hectares. Fishing constitutes the principal economic activity involving almost the entire human population (82.5%). The ecosystems harbour adequate diversity of natural fish food and flora (especially phytoplankton and zooplankton) which support and favour the growth of over 26 fish species that belong to 15 families. Among the commercially important species in terms of dominance on percentage weight basis are Mochokidae, Cichlidae, Claridae and Characidae with an overall average standing crop of 88.24 kg/ha based on gill net experiment. The study, based on the intrinsic ecological attributes and local people willingness for sustained contribution of fisheries to food supply indicates that with adequate management Tatabu flood plain ecosystems have tremendous fishery potentials that would enhance the economic well being of the communities. Several management options that are applicable to similar plain are discussed.

INTRODUCTION

Fish has become an acceptable source of animal protein in most regions of the world in recent times. In Nigeria fishery industry is classified into three major sub-sectors. artisanal and industrial capture fishery and aquaculture. And of which the inland artisanal capture fishery contributes significantly to the national food requirements and economics, making up to 85 – 90% of domestic production. In addition, the inland fishery, which is based on exploitation of the rivers, reservoirs, lakes fishponds and flood plains, provides economic support and livelihood in rural areas where 70% of the Nigerian population lives. But these, though are renewable resources, are threatened as a result of overexploitation of the fishery resources.

In its natural state flood plains provide nutrient-rich, sheltered habitats used by fish for spawning, nursery areas and good habitat for adult fishes. Apart from fishes that are endemic to flood plains some other commercially important species require seasonally flooded grounds. More than two-thirds of the fish we eat depend upon flood plain at some stage in their life cycle (Dugan, 1990). The Lake Chad fishery comprising that of the flood plains of the Logone and Chari Rivers from Cameroon and Central Africa, respectively, is one of the richest fishing areas in Nigeria with a production potential of about 1000kg/ha/year (Dugan, 1990) that provide jobs to the inhabitants. The Hadejia/Nguru flooded areas have long been known as a centre for fish production and with over one million of the inhabitants engage in either wet-, dry- season or all-year fishing. Several other studies (Welcomme, 1975, Awachie, 1976) have shown that Nigerian flood plains have tremendous fishery productivity sustaining the human population built around them.

But in recent times, the increasing intensive and indiscriminate exploitation by the rapidly expanding human population have adversely altered flood plain ecology with consequence on its fisheries. When combined with natural stresses such as droughts, have resulted in reduced

productivity and low carrying capacity. And yet adequate scientific information on most of the flood plains are scanty to ensure long-term sustainability of fishery resources at levels which promote optimum utilization and maintaining availability for present and future generation. This paper attempts to document some aspects of the biological components of Tatabu flood plain that are applicable to sustainable fishery development of this and similar plains.

Materials and methods

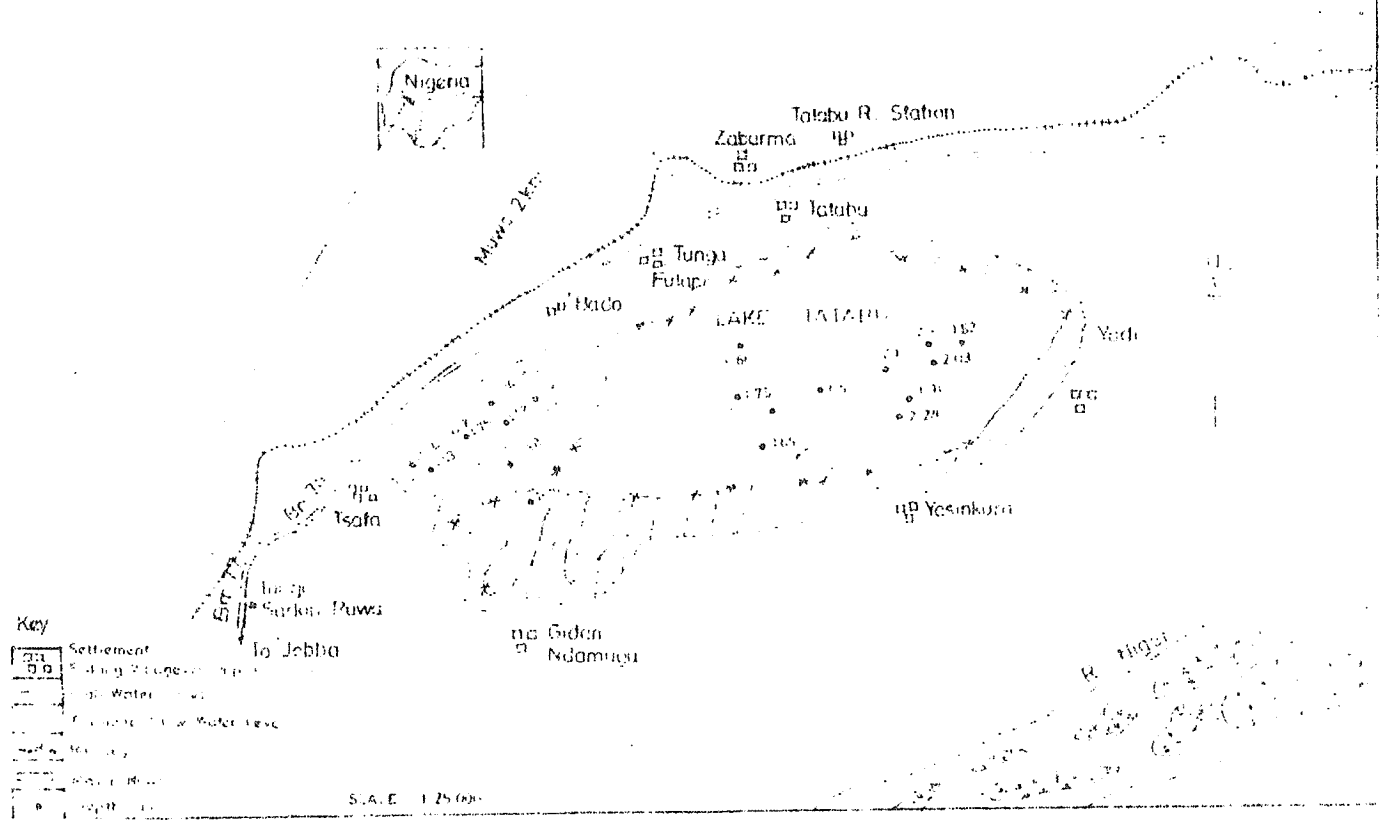
With the aid of a GPS (Geo-Positioning System), the entire lake was circumnavigated by a motorized boat and both the length and breadth were determined. The mean depth was determined by tying a heavy object to a string, lowered into water until it touched the bottom while boat was steady at random sites. The string was marked at water level and pulled out for measurement. Also at these sites water samples were taken to determine the physico-chemical characteristics of the associated lakes. A frame survey involving counting of all fishing villages, number of fishermen and gear types. To evaluate the plain fish species composition and biomass three fleet of multi-filament gill nets consisting of 50.8, 63.5, 76.2, 88.9, 101.6, 127.0 and 177.8 mm stretched mesh sizes were used to sample both in dry and wet seasons within the associated lake. The 50.8 and 63.5 mm mesh sizes were included to facilitate a checklist of species in the lake

Results and Discussion

Tatabu flood plain and associated lakes

Tatabu flood plain is located north of Jebba, between $9^0\ 12^1 - 9^0\ 14^1$N and $4^0\ 53^1 - 4^0\ 58^1$E (Fig. 1). It is found downstream of Jebba and Kainji dams and used to be part of the extensive Niger River system dominated by over-spill from Niger River. Besides the Niger River, three other streams (Ebigi, Gbwadwa and Lyantelya) running in a south easternly direction empty into the flood plain, two of these are seasonal streams. However, the two hydroelectric dams (Jebba and Kainji) have markedly altered the extensive flood plain of Tatabu. Shortly after the two dams were built in 1960s and 1980s, extensive areas which used to be under water for several months, permitting a dense growth of grasses and forbs to maintain the ecological stability of the plain decreased appreciably. The situation further became amplified such that associated lakes were obliterated by mid-eighties leaving only stagnant pools of water. Up till 1988 from a distance no water was visible and the former lakes' bottom were overgrown with both semi terrestrial and aquatic vegetation. The situation prompted the Institute to provide both technical and financial supports to resuscitate the flood plain. Thus by 1989 the entire flood plain and associated lakes which were reduced to stagnant pools of water became restored including the fishery resources and other ecological components (Daddy *et al.*, 1988). After restoration and at the high water level the entire plain which hirtheto usually broke into series of pools and depressions merged to form an entity.

Fig. 1. Map of Tatabu flood plain showing fishing Villages/Camps defining the landscape and the associated lakes at various depths.



The all seasonally waterlogged area measured about 4.87 and 1.43 km in length and breadth, respectively. Thus the total surface estimated was 696.4 ha with water depths ranging from 0.38 to 2.28 and a mean of 2.02 m (Fig. 1). The daily fish catch increased from 4.10 to 7.05kg/fisherman/day few months after restoration but not up to 8.50kg/fisherman/day as reported by Chude (1979). Fish species composition also improved indicating influx of new fish species migrating with the flood. Thus indicating

Limnological characteristics of Tatabu flood plain

The physico-chemical characteristics of the flood plain are typical of Nigerian inland waters and also reflect basin conditions. For instance the temperature, pH, Dissolved Oxygen and conductivity ranged from 28.4 – 30.0^{0}C, 7.2 –7.4, 5.0 – 5.6 mgl^{-1} and 98 – 100u mhos cm^{-1}, respectively. Nutrient species such as Nitrate-nitrogen (0.2 – 0.5mgl^{-1}) and phosphate phosphorus (0.02 - 0.1mgl^{-1}) though low are generally within limits found in the Jebba lake area and typical of guinea savanna flood plains (Adeniji, 1980).

In general the physico-chemical environment of the associated lakes is favourable to fish growth and development and is capable of sustaining a commercial fisheries such that currently exist. The flood plain is devoid of any industrial establishment and major human settlements and consequently the aquatic environment is not under any immediate threat of pollution. In addition Tatabu flood plain ecosystem harbours adequate diversity of natural fish food fauna and flora (especially phytoplankton and zooplankton) that are important for fish larval recruitment in natural ecosystems. The copepods and members of the diatoms dominate the zooplankton and the phytoplankton, respectively. The cladocerans and rotifers (zooplankton) are also abundant in addition to members of the green and blue green algae (phytoplankton).

Fishery resources and exploitation

The importance to the fish production of Tatabu flood plain after restoration cannot be over-emphasized. The booming roadside fish market at Tatabu village, which had disappeared when the associated lakes dried up, has been restored. It is possible that other similar flood plain lakes along the stretch of Niger River, which has been affected by flood control, could be restored in a similar manner. Table 1 shows the fish relative species composition and abundance The relatively shallow lakes and the alternate flooding and drying of the colonizing vegetation coupled with migration of fish during the floods are advanced for the diverse species composition and productivity. The commercially important fish families include Mochokidae, Cichlidae, Claridae, Characidae with an estimated standing crop of 88.24/ha/year.

Similar to most Nigerian flood plains (Welcomme, 19775; Adams, 1985;) fishing constitutes the principal economic activity involving almost the entire population of 4,317 of which (82.5%) are principally fishermen. There are over 234 full time fishermen using 115 non-motorized boats with mean weight landing of 2.55 kg per boat. Fishing gears used are mainly gill nets of which more than 80% are considered illegal (<2.49 mesh size). Also in use are hooks and traps. However, the waterlogged ecosystem is also important as source of water for domestic use, dry season irrigation and suitable food source and shelter for migratory avian and livestock during the dry season. But in the attempt to exploit the resources some irreparable damages are impacted leading to the degradation of the fragile ecosystems. The lake system areas intensively fished but more or less unmanaged. Fishermen operate largely from villages and temporary settlements/camps along the peripheral areas of the flood plain. Fishing is communal and throughout the year but more intensive during the dry season when series of flood ponds and pools segregate due to water recession Depending on the season. gillnets, hooks. traps, gourds, and to a little extent cast nets are used for fishing However, use of poison for fishing. perhaps as a traditional conservation strategy, is considered a taboo within the entire flood plain complex. At low water level series of ponds and pools of water usually dot the landscape. Some of these are owned by individuals and partially managed unlike the more extensive Tatabu and Dodo lakes, which are communally owned and fished. However, at this period of low water level small sized mesh nets (1 to 2 ins.), traps of various sizes and shapes are used to fish indiscriminately. Atimes fish species such as *Protopterus annectens* are dug out from the mud while the narrow outlet channels are netted to catch fish escaping with water flowing back into Niger River channel. These practices coupled with increasing number of fishermen are advanced for the reduction of fish sizes caught, thereby threatening the future of Tatabu flood plain fishery

Table 1: Fish species composition and relative abundance (%) at both dry and wet seasons.

Family/Species	*Relative abundance*	
	Wet season	**Dry season**
Lepidosirenidae		
Protopterus annectens		0.12
Polypteridae		
Polypterus senegalus	0.32	0.50
Gymnarcidae		
Gymnarchus niloticus	0.22	0.25
Notopteridae		
Xenomystus nigri (Gunther, 1868)		0.37
Osteoglossidae		
Heterotis niloticus		0.37
Characidae		
Hydrocynus forskali	0.11	
Alestes baremose	1.51	1.12
Citharinidae		
Citharinus citharus	0.12	
Cyprinidae		
Barbus occidentalis	0.12	0.50
Charidae		
Chana obscurus *(Myers & Shapovalor, 1932)*	0.22	0.12
Schilbeidae		
Schilbe mystus	0.65	0.74
Eutropius niloticus	0.22	
Bagridae		
Auchenoglanis occidentalis	0.43	0.25
Mochokidae		
Synodontis nigrita	37.97	40.82
S. clarias (link, 1758)		2.11
S. ocellifer (Boulenger, 1900)	0.97	
S. courteti (Pellegrin, **1906**)	2 70	
S gambiensis (Gunther, 1864)	0.97	
Claridae		
Clarias anguillaris	0.86	0.12
C. lazera	0.65	
Anabantidae		
Ctenopoma kingsleyae (Gunther, 1896)	0.86	0.62
Cichlidae		
Sarotherodon galileaus (Linne, 1758)	39.16	29.40
Oreochromis niloticus (Linne, 1758)	3.45	4.22
Tilapia zilli	2.59	3.35
Hemichromis bimaculatus (Gill, 1862)	0.86	0.37
H. fasciatus (Peters, 1852)	5.07	14.64

Problems in present flood plain management

Tatabu flood plain communities from time immemorial have established rules and regulations governing fishing activities. Traditionally, restrictive measures as laid down and obeyed by all community members include prohibition of immature catches, fishing on festival days, use of chemicals and magical power during fishing. In addition to these each village appoints head of fishermen called Sarkin Ruwa who ensures that guidelines are obeyed and other taboos that could anger "god of water" with consequence on poor fish harvest are strictly avoided. Violators are often fined and fishing gears are confiscated. In spite of these measures demographic pressure and increasing demand for agricultural land, grazing grounds and vegetation gathering are today straining and in some cases breaking the traditional management systems. Also recent changes in river flow have decreased the capacity of natural flood plain systems to absorb existing pressure and even the potential to absorb further impact. These factors have been exacerbated by lack of adequate national policy on flood plain utilization. In cases where a kind of rudimentary policy exists, exclusive control over resource management is placed in the hands of central government rather than traditional institutions, which often have much greater empirical knowledge of the resources and their management.

The need for rapid and rationale aquatic resource management based on indigenous knowledge and scientific information has become evident. It is unlikely that local communities can accomplish this change neither the national government with the present bureaucratic instrument. Therefore, the need to use available resources and interests of the local communities, complimented by central government institutions to advance sustainable and increased fishery production for economic well being of the fishermen

Flood plain fishery production and management strategy

Scudder and Connelly 91985) identified two major categories of management and traditional riverine fisheries in the Middle Zambezi River and the Kafue flood plains. They termed these as inadvertent or unintentional management strategies, such as water tenure, ritual prohibitions, taboos and magic The intentional management includes gear restrictions, closed seasons and flood plain intensification. Both these strategies can be applicable to the situation in Tatabu. The implementation of the intentional management is only possible with the support of Government. The local community members usually have empirical knowledge of their entire natural ecosystems such that with a kind of coordinating structure, the overall benefits from available resources can further improve the lots of the communities. This should entail the federal government provides the enabling environment (policy, funds, etc) with relevant institutions to evolve a community-based management approach for Tatabu fishery. The experience already gained by NIFFR through the German Technical Agency (GTZ) that evolved a community-based fisheries management of Kainji Lake would be relevant. The overall objective is targeted at an optimum management of the fisheries resources and, also increases the fish production of Tatabu flood plain that will improve the standard of living of the community members. However, since fishing like most other economic activities is practiced on an individual basis and coupled with the fact that in almost any community, there will be divisions, on either social, ethnic, economic, political or other lines, a second approach based on individual can still create the desired impact.

Apart from the relatively extensive associated Tatabu and Dodo lakes, which are communally owned there are several fishponds that are owned by individuals. These ponds can be developed and managed by such individuals or a group of people with common interest. This can be called "flood plain aquaculture" in which management is centered on water supply and manuring that is usually free and locally abundant from free ranging domestic animals kept by fishermen themselves. A similar approach was developed within Hadejia/Nguru wetlands in the

north east of Nigeria (Matthes, 1990). The individual or group develops and manages naturally existing ponds for improved fish production and greater benefits.

Summary and Conclusion

Tatabu flood plain and its associated lakes are naturally endowed with all enhancing factors for fishery production but human population pressure, hydrological developments and intensive fishing coupled with recent natural stresses have led to depletion of resources. These problems notwithstanding, the favourable physio-chemical features, willingness of local communities and availability of diverse and commercially important fish species are indicators that under proper management strategies the potentials for sustainable fishery production to improve the well being of the local communities can be assured. This should centre on a dynamic partnership based on the existing capacities and interests of the local community, complemented by the ability of the national government to provide enabling environment and other assistance for Community-based Fishery Resources Management

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